Sapienza University of Rome

Doctoral Thesis

Three essays in italian economic history

This dissertation is submitted for the degree of
Doctor of Philosophy at the european Phd program in Socio-economic and statistical studies

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Declaration of Authorship

I declare that this thesis titled Three essays in italian economic history and the work presented in it are my own. I confirm that except where specific reference is made to the work of others, the contents of this dissertation are original and have not been submitted in whole or in part for consideration for any other degree or qualification in this, or any other university. This dissertation contains nothing which is the outcome of work done in collaboration with others, except as specified in the text and Acknowledgements.

To my father

Acknowledgements

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Introduction

This Ph.D. thesis is an attempt to analyze the deeper causes of territorial disparities in Italy (north-south), adopting a quantitative historical approach. The reason for this choice derives from the observation of the persistence of these imbalances over time, which still remain in vogue nowadays. Indeed, there is no consensus on their rooted causes among scholars, nor on the timing of the origin of gap widening. Therefore, the adoption of a historical-quantitative approach seemed to be inevitable in such a circumstance to delve into this issue.

The manuscript is composed of three articles addressing three specific and fundamental aspects of the regional gaps. In the first article, I focus on the disparities in human capital accumulation in the Post-Unification period (1871-1921). The work contributes to the debate on institutions and economic development by assessing the relationship between landownership concentration and education levels in the italian provinces and districts. Indeed, land inequality is a measure of wealth dispersion *per sè*, and its observation contributes to shed new light on the level of concentration of resources among the population. Second, in a prevalently agrarian economy, it constitutes the main productive input that, if highly concentrated in the hands of few landowners, can lay the foundations for the creation of an oligopsony in local labor markets. In such a situation, the mass of rural labourers loses bargaining power and is left with the only alternative to migrate, looking for better conditions outside agriculture. Finally, land inequality is an indicator of *de facto* political power in the hands of local notables. Under the assumption that large landowners take over local municipalities, when there is autonomy of decision to invest in human capital, as in the case of Italy in the Post-Unification decades, their interests lay on the vote against the expansion of public spending on mass schooling. Hence, I believe it is highly informative to uncover whether land inequality, proxying the presence of *latifundia* in the italian countryside, limited the adoption of human capital promoting institutions.

Using historical data both at a district- and province-level, I find evidence of a

negative effect of land inequality on literacy rates, the main indicator of education levels at that time. IV estimates at each point in time, using the presence of malaria as a source of exogenous variation in *latifundia* creation, allow me to temperate concerns regarding potential endogeneity. Indeed, the presence of malaria may have contributed to define the settlement pattern of rural workers, acting as a fundamental driver of *latifundia* creation in the italian countryside. Once I explore the panel dimension of the dataset, further evidence is provided to support the negative association between land inequality and education levels, albeit it seems to vanish over time, in line with the "passive modernization process" Italy was facing at that time. Further, I explore the mechanism of transmission behind the observed relationship in order to distinguish between the impact of supply and demand factors. Thus, I evaluate the impact of land inequality on several outcome-based variables capturing supply and demand factors in education. I argue that landownership concentration may have adversely affected literacy rates not only by influencing the supply of schooling through political process, but also by affecting the private demand for education of landless peasants.

In the second article, I focus on another variable widely considered at the root of the North-South divide in Italy, i.e. social capital. Nevertheless, rather than analyzing its impact on economic development, I mainly focus on the conditions that shape it in the first place. By analyzing once more the rural economic structure of Italy during the "liberal age" (1861-1911), I challenge the view that social capital is uniquely determined by the *communal* experience in the Middle Ages. This is a thesis put forth by Putnam and then tested by Guiso, Sapienza and Zingales in a quantitative way, who stress the long-term persistence of the effect through centuries. I advance the hypothesis that the prevalence of short-term tenancy agreements in agriculture, here represented by a huge mass of day workers (*braccianti*) and associated with the presence of large estates called *latifundia*, discouraged cooperation between landowners and peasants, then translating into lower levels of civic engagement and participation. By contrast, long-term contracts, possibly containing a risk-sharing component, by providing agents with iterated games, discouraged opportunism and created cooperation, an attitude ingrained in the cultural traits of the population and associated with higher civic capital measures. Such a cultural trait is then transmitted over generations, and it persists within the community, even after a change in the incentives structure has taken place.

Hence, I test the long-term effect of the diffusion of daily and seasonal laborers in agriculture in 1881 on various indicators of social capital in the present day, some of them

previously unexamined. The measures of social capital are divided into two distinct groups: *i)* civic capital measures identifying a prosocial behaviour in civil society; *ii)* measures indicating a less proactive behaviour associated with civic mindedness and compliance with rule of law (tax compliance). I find that short-term tenancy agreements in the past negatively affected civic capital measures in the present-day. Furthermore, the results seem to be robust both to different indicators employed in the empirical analysis and to different model specifications. These findings raise two considerations. On the one hand, changes in social capital might be the consequence of institutions more recent than the experience of self-government in the *Middle Ages*. On the other hand, this work has the merit to switch the attention given to pre-industrial economies from urban centers to the social life in the countryside in order to explain disparities in civic engagement.

IV estimates using the presence of malaria as a source of exogenous variation rule out further concerns regarding the presence of potential endogeneity. Moreover, I address the issue of spatial dependence, potentially deriving from different sources, such as emulative behaviours and spillover effects in a sort of diffusion process. The share of short-term contracts still retains its significance, accounting for different sources of spatial correlation notwithstanding.

Once having determined such a robust correlation, I try to provide an explanation of the transmission of this cultural trait over time. I indicate the so-called "industrial districts", developed after the second world war in some areas of the center-north, as the main channel of transmission of the aptitude of cooperation from preindustrial Italy to the present-day. A culture of mutual cooperation, sedimented in communities where sharecropping activities were mostly diffused, i.e. in the places now known as "third Italy", laid the foundations for the subsequent creation of the industrial districts. Using as outcome a dummy variable that takes on value 1 whether the municipality is part of an industrial disctrict and 0 otherwise, I test the hypothesis that their adoption is negatively correlated with the prevalence of short-term tenancy agreements in liberal age. The results confim my conjecture and are robust to different estimators employed to assess their relationship. OLS, IV and spatial regressions are all consistent with a negative association between them.

In sum, short-term relationships in the labour market with a distorted bargaining power in favor of one of the two agents induce an opportunistic behaviour of the other. While this aptitude can persist through time and rarely be changed, a new institutional

setting reproducing a different incentives structure should suddenly have the opposite effect.

The results are particularly interesting, especially in light of the nature of the typical human behaviour accounted for in neoclassical economics models. Indeed, this work puts the accent on a different concept of the cultural trait then translating into higher civic engagement. As the anthropologist Sahlins argued, the idea that our personal interest is embodied in the common interest has been transformed into its opposite, i.e. common interest thrives if everybody behaves as a utility- or profit-maximizing economic agent. Similarly, Guiso, Sapienza and Zingales point to the way people rationalize success and failure (self-efficacy) to explain how civic capital handed down through centuries. They assert that people with high self-efficacy are more likely to attach success to effort and failure to bad luck and, conversely, people with low self-efficacy exert little effort because they will attribute success to luck and failure to lack of effort. By contrast, the mechanism of transmission based on the role of the industrial districts lies on the conjecture that the maximizing behaviour of the private agents hinges on the network of interdependent social relations and cooperation among private agents in the same community and between them and the local public institutions. Had cooperation and social relations been non-existent, not only trust among people would not have flourished, but also the small and medium firms of a district would not have been as competitive as they are today.

While far from reaching exhaustive conclusions, the present paper aims to stimulate the debate and spur future research on the origins of social capital imbalances and its transmission through time. Further attempts are needed in order to have a better comprehension of the transmission of civic capital, whether it occurs *via* socialization and education or by means of the creation of new institutions.

In the third and last article, I carry out an accurate data reconstruction to present estimates for the provincial population at borders in 1871 in the pre-unification period (1765ca.-1861). The main aim is to link them with the population data coming from censuses in the post-unification period, and finally extend the time series backwards. Indeed, the reason why many scholars have restricted their analyses to the post-unification period has undoubtedly to be found in the greater availability of data. Consequently, I believe that the pre-unitary period has not been much explored in literature, and certainly little attention has been devoted to quantify economic and social phenomena before Unification. Further, having detailed demographic information for a

period whose data are scarce is highly informative for economists and historians, and the demographic trend of a country represents a crucial tool to analyse its process of development and growth. Indeed, whether population is positively or negatively correlated to the scale of the economy is still an open question and no consensus has been reached among scholars yet. Moreover, local population data, especially at province-level, permit to study within-country variability of different demographic patterns. The reconstruction of the provincial population represents the first attempt for building new quantitative evidence on the pre-unitary period, providing an adequate representation of the demographic trends at a detailed territorial level. Finally, and I believe this represents the most important contribute of the present work, I present estimates for Italy's provinces at borders in 1871, in order to make them comparable with provincial data for the post-unification period. I employed a bottom-up approach, consisting in gathering information on the population at a municipal or district-level, whenever possible, and then assembling the respective values considering provincial borders at Unification, and taking into account all the administrative changes in boundaries occurred throughout the period under analysis.

The new provincial data unveil the existence of different patterns of population growth that neither the overall figures for Italy nor regional data unfold. My estimates confirm the existence of a positive trend in the italian population throughout the whole time span considered. Furthermore, my estimates of the total italian population and of the population for macroregions are consistent with estimates coming from alternative sources. Nevertheless, once we move to a more disaggregated territorial level, large provincial disparities emerge, showing specific long-term demographic patterns. The main findings of the analysis suggest that: 1) Italy's population growth in the period 1791-1861 can be divided in two different demographic regimes: the low growth regime from 1791 to 1821 and the high growth regime 1821-1861; 2) a handful of provinces, notably the ones in the core Tuscany and Milan, grew faster than the Italian average in the low growth regime; 3) some provinces grew slower in the high growth regime; 4) convergence in growth rates is effective before 1821 and undetected from 1821 to 1861.

I interpret these results as evidence of new advances in agrarian technology and more innovative institutions in those areas registering population growth rates above average. While the former constitute an important element of crop variety and a new way of insurance against excessive weather variability, the latter mainly refer to the role of provision authorities to better balance the risks of bad weather.

Chapter 1

Landownership concentration and human capital accumulation in Post-Unification Italy (1871-1921)

This paper contributes to the debate on institutions and economic development by assessing the relationship between landownership concentration and education in Post-Unification Italy (1871-1921). Using historical data both at a district- and province-level, I find evidence of a negative effect of land inequality on literacy rates. This result is confirmed when a large set of control variables is included in the analysis. IV estimates using the presence of malaria as a source of exogenous variation rule out further concerns regarding the presence of potential endogeneity. Further evidence is provided once I explore the panel dimension of the dataset. In addition, by analysing the impact on intermediate outputs such as enrolment rates in primary school, child-teacher ratio, school density, child labor and municipality expenditures, this paper provides insights on the mechanism behind this relationship. Land inequality may have adversely affected literacy rates not only by influencing the supply of schooling through the political process, but also through the private demand for education.

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1.1 Introduction

Countries characterized by extractive institutions and by the concentration of political power in the hands of small elites tend to display pattern of limited long-term economic growth (Acemoglu et al. [2001, 2005]). Recent studies have also shown that the role of human capital is essential in explaining the link between institutions and economic development (Gennaioli et al. [2012], Glaeser et al. [2004]). Under the assumption that political power is linked to landownership concentration in pre-industrial economies, assessing the role of land inequality becomes fundamental for understanding the path of development of countries and regions. Galor et al. [2009] built-up a theoretical model where capitalists, on the one hand, push for policies aimed to promote the education of the masses to have a skilled labour force, whereas landowners, on the other hand, support policies that deprived the masses of education. The interest of landowners was indeed to reduce labor mobility to keep wages low and to have available labor force in the countryside. This is especially true in later stages of development, once the industrialization process has already occurred, increasing the return to education and the incentives to invest in human capital (Galor [2011]). At the same time, Engerman and Sokoloff [1997], Sokoloff and Engerman [2000] assert that Latin America elites blocked the expansion of mass schooling and suffrage to retain their political power. More recently, another body of literature has called this view into question, as incentives to invest in human capital that enter individuals' utility functions, as well as concerns regarding their limited budget constraints, may be considered non-mutually exclusive channels of transmission of the effect. A more equally distributed land ownership, indeed, may have contributed to facilitate access to resources to be invested in acquiring literacy and numeracy skills (Cinnirella and Hornung [2016], Tapia and Martinez-Galarraga [2018]), apart from the supply-side mechanism, linked to the political process[1].

This paper aims to analyse the relationship between land inequality and literacy rates in the late nineteenth century and in the early twentieth century in Italy[2]. I built-up a new dataset both at a district- and at a province-level in Italy for the 1871-1921 time-span, which allows me to exploit both the time and the cross-sectional dimension of the relationship between landownership concentration and education. I conduct several

[1] Andersson and Berger [2019] document that educational expenditure was *higher* where the distribution of political power was more unequal in nineteenth century Sweden.

[2] For a more comprehensive view of the idea of scarcity of human capital as a drag to modern economic growth in Italy, see Di Martino and Vasta [2017].

regressions at each point in time during the period taken into consideration, showing how this relationship seemed to be fairly stable over time. Only once I explore the panel dimension of the dataset, evidence of the vanishing effect of this relationship occurs. This was likely due to different institutional shocks, such as the enfranchisement of the population and polity regime changes in the decision to implement public policies (i.e. decentralization *vs* centralization). The most important was the introduction of the *Daneo-Credaro* law, in 1911, which transferred the decisions to invest in public schooling from municipalities to the central government, thus limiting the political power of local notables. By letting interact landownership concentration with time shocks, I employ a stepwise *diff-in-diff* strategy to account for those institutional changes potentially modifying the size of political power. Both in the cross-sectional and in the panel structure of my dataset I have an advantage in terms of identification. The panel dimension allows me to control for time-invariant unobserved heterogeneity, whereas the cross-sectional dimension permits to exploit the advantages of an instrumental variable approach that helps identifying a causal relationship between landownership concentration and education levels. More specifically, I use the presence of malaria as a source of exogenous variation in landownership concentration. This was a thesis put forth by Celli [1933], who linked malaria endemicity with the creation of large estates, a pattern that has been observed for centuries in the Pontine marshes, a plain in the surroundings of Rome.

I find the following results. Separate cross-section estimates at different points in time reveal a negative impact of my measure of land inequality on literacy rates. IV estimates, using the presence of malaria as a quasi-experiment, allow me to rule out concerns regarding potential endogeneity. Once I explore the panel dimension of the dataset, further evidence is provided to support the negative association between land inequality and education levels, albeit it seems to vanish over time, in line with the "passive modernization process" Italy was facing at that time (Felice [2013]).

My contribution is twofold. First, to the best of my knowledge, this is the first attempt to document the impact of land inequality on human capital accumulation in Post-Unification Italy. Although a bunch of literature has documented its impact on economic development both in Italy and in global perspective, I provide a reliable proxy to measure its impact in a quantitative way. Second, following a recent branch of research, I explore the mechanism of transmission behind the observed relationship, so as to distinguish between the impact of supply and demand factors. I argue that landownership concentration may have adversely affected literacy rates not only by

influencing the supply of schooling through political process, but also by affecting the private demand for education of landless peasants. A vast literature has primarily focused on the role of landowning elites to prevent the poor majority from gaining education and power. Under the assumption that large landowners take over local municipalities, when there is autonomy of decision to invest in human capital, as in the case of Italy in the Post-Unification decades, their interest lay on the vote against the expansion of public spending on mass schooling. I gather information on people enrolled in primary schools, on the number of public schools and the corresponding appointed teachers, and on municipal expenditures, and I test the relationship between these variables and land inequality. My results document that while supply factors mattered, it seems that even demand factors played a role. These findings are also corroborated by using child labor at district-level in 1881 and literacy for people aged between 15 and 19 as additional outcome variables. Indeed, in agrarian economies such as Italy in liberal age, the poor majority facing tightening budget constraints and limited opportunities both for upward mobility and to offer their labor outside agriculture, had less incentives to invest in human capital.

My empirical findings are also consistent with alternative but mutually non-exclusive explanations of human capital accumulation in rural and southern regions of Italy. Cappelli [2016] asserts that fiscal capacity, rather than political voice, was the main driver of public schooling supply. Again, Cappelli [2015], in another study, highlights the role of centralized primary schooling to foster education and escape a human capital trap, after the implementation of the *Daneo-Credaro* law, in 1911. Although public policies seemed to be fundamental in determining a steeper trend in human capital accumulation and then activating a convergence process for the most disadvantaged areas (Cappelli and Vasta [2019]), still little is known about the relevance of demand factors to explain imbalances in education levels. Generally, the forces that led to the end of the gap in education between North and South can be correlated with the process of modernization and industrialization of Italy, ended after the World War II, which in turn may have caused a higher demand for education (Felice [2012]). In summary, land inequality affected human capital accumulation through diverse ways. This influence not only operates through the role of "extractive institutions" blocking the supply of public schooling infrastructures, but also via demand effects.

I proceed as follows. In Section 1.2, I report a literature review. In Section 1.3, I

briefly provide a theoretical and historical background of Post-Unification Italy. Section 1.4 describes the data, whereas Section 1.5 outlines the econometric methodology and reports the main empirical results, focusing on the role of malaria as a source of exogenous variation of *latifundia*, allowing the identification of a causal relationship between land inequality and education. A particular attention is also devoted to panel estimates (stepwise *diff-in-diff* approach) and some robustness checks in order to validate the identification strategy. Section 1.6 focuses on the different possible channels of transmission of the effect. Section 1.7 provides concluding remarks.

1.2 Literature review

The literature on the role of inequality and its long-run effect on human capital is vast and presents a wide empirical support. As already mentioned, Galor et al. [2009] assess the inverse relationship between land inequality and education formalizing a theoretical model. They draw an empirically testable prediction by using data for US for the 1900-1940 period, finding that changes in landownership concentration negatively affect education expenditures. Moreover, in order to demonstrate the causality of the effect, they exploit as an instrument the interaction between changes in the relative price of agrarian crops and in climatic characteristics across states. Ramcharan [2010] investigates the effect of land inequality on redistributive policies. By looking at US census data for the 1890-1930 period, he finds a negative association between inequality and expenditures in education, identifying a causality relationship using geographic variables as a source of exogenous variation in land inequality[3]. In a similar way, Vollrath [2013] shows a negative correlation between landownership concentration and taxes for funding public schooling in US counties in 1890. The same results can be found in the work by Chaudhary [2009], who links low public spending on primary schooling with greater castes' interests in India[4].

Go and Lindert [2010] aim to explain differences in enrolment rates between the North and the South of US looking at local autonomy and a more widespread access to political voice for the masses in the North. They also analyze the effect of enfranchisement on tax levels for public schooling and in turn on enrolment rates. Along the same line of research, focusing on estimating the correlation between schooling and

[3]More specifically, the author uses data for crop choice, rainfall intensity and surface elevation.

[4]The same results have been found for the cases of Korea and UK, respectively, by Go and Park [2012] and Goñi [2013].

education levels with inequality in political power[5], Mariscal and Sokoloff [2000] find that inequality in Latin America is negatively associated with enrollment and literacy rates. Furthermore, they also argue that the extension of the franchise promoted mass schooling, a result also found by Acemoglu and Robinson [2000] and Gallego [2010]. The latter also argues that the degree of democratization enhances primary education, while the decentralization of political power has an impact only on secondary and higher education. At odds with these latter findings, Aghion et al. [2012] argue that the role of democratization is irrelevant to explain higher education levels, and they propose military rivalry as a fundamental incentive for countries to invest in mass schooling.

Less research has been done on a more demand-based viewpoint as for the historical link between land inequality and human capital. The first attempt dates back to Galor and Zeira [1993], who highlight that in the presence of frictions in the credit market, an unequal distribution of resources can have a long-lasting effect on lower classes' ability to invest in human capital. Individual underinvestment in human capital resulting from capital market imperfections is also found by Deininger and Squire [1998]. At the same time, Reis [2005] provides a somewhat similar explanation of disparities in education levels across european countries in pre-industrial times. Indeed, he puts more emphasis on the role of the opportunity cost of education for the vast majority of the population rather than on the powerful landed nobility acting as a costraint for the supply of schooling. Cinnirella and Hornung [2016] find that emancipated peasants had more incentives and resources to invest in education after the abolition of serfdom in nineteenth century Prussia. The negative relationship between land inequality and literacy rates was thus accentuated in prussian counties with a greater number of cases of land and labor redemptions, indicating the achievement of complete independence from the feudal landlord. More in line with the present work, Tapia and Martinez-Galarraga [2018], under the assumption that girls were not fully engaged in agricultural tasks, show that while the fraction of farm laborers had a significantly negative impact both on male and female enrolment rates, land access inequality only has an impact on the supply of male school teachers. In the same direction, they also argue that inequality affects boys' schooling enrolment more than the provision of male teachers. Lastly, the results seem to be unaltered when the analysis is restricted to a rural sample, where plausibly landowner's power would even be greater. Similarly, Tapia and de Miguel Salanova

[5]Henceforth, political power, political voice and electoral franchise will be used with the same meaning.

[January 2019], relying on a newly assembled dataset on individuals living in Madrid in 1880 and in 1905, find that although the supply of mass schooling improved access to education of children from disadvantaged backgrounds, the public effort was insufficient to offset the constraints these families were to face.

I contribute to this literature providing new insights on the role of land inequality on human capital accumulation in Post-Unification Italy, a country characterized by huge inequality levels and an important North-South gap. First, I provide a new instrument linked to the creation and maintenance of *latifundia* in the first place: the presence of malaria. Moreover, I show that land inequality blocked the expansion of education not only through "institutions", as was clear by the "extractive institutions" hypothesis, but also through the severe budget constraints and limited opportunities outside agriculture the vast majority of the population in the countryside was facing at that time.

1.3 Historical context

1.3.1 Human capital in Post-Unification Italy: an overview

Italy registered on average (Census data) literacy rates equal to 35% in 1881, a level higher than Guinea's literacy rate of 30,4% and immediately lower than 36% of Burkina Faso in 2015. Hence, it is relevant to understand the determinants of human capital accumulation in the decades immediately after the Unification of the country, occurred in 1861, in order to have a better comprehension of the mechanisms behind economic growth and human development. This will also allow me to draw new insights and policy implications for developing countries in the present-day, mainly in light of prompting education and raise human capital accumulation.

Italy was also characterised by wide educational disparities: for instance, in the same year, 1881, literacy rates ranged from an average value of about 18% in the South to almost 50% in the North. The wide scope for convergence generated overall literacy growth rates at ten-year intervals sistematically higher in the South, reaching a level of about 30% in 1891, while in the same year in the North they grew at a pace of about 21%. Even after the implementation of *Daneo-Credaro* law, literacy growth rates in 1921 were sistematically higher in the South, showing levels of about 68%, much higher than the 40% registered in the North. The centralization of decisions of public investment in mass schooling, then, accelerated the speed of literacy growth rates, especially in the South. Indeed, even though disparities in literacy rates between North and South

persisted until the second postwar, centralized education policy seemed to have played an important role to prompt mass schooling, acting as a "substitute for prerequisites" (Allen [2011];Gerschenkron [1962]; Cappelli and Vasta [2019]). Yet, questions referred to the deep-rooted causes of differences in literacy levels between North and South remain still open. The literature has focused mainly on the supply-side of the story, either stressing the role of fiscal capacity or the role of political voice, by testing whether the process of democratization was effective to boost human capital and economic growth. I believe that other factors may have triggered incentives to invest in education, both from a supply and a demand side. Moreover, Felice [2012] argues that human capital was the main key factor behind the divergence in GDP growth rates in the late nineteenth century and in the first decades of the twentieth century, namely between the onset of the Second Industrial Revolution and the second postwar[6]. Therefore, it is essential to study the determinants of human capital regional inequalities from Unification until the rise of the Fascist Party in order to shed new light on the North-South gap in Italy, and draw new implications for developing countries in the present-day.

1.3.2 Italy's education system, 1859-1821

During the process of Unification, the Casati law (1859), firstly operating only in the Kingdom of Sardinia, was extended to the annexed regions that became part of the Kingdom at a later stage. The subsequent education system consisted in first-grade primary school free of charge, offered by municipalities according to their fiscal capacity. The first two years of primary school were mandatory both for boys and girls, but households were not expected to pay sanctions in case of no compliance with the rule. Municipalities with more than 4000 inhabitants were the only responsible for setting-up second-grade schools, characterized by other two additional years of primary schooling. Each municipal council was then authorized to build schoolhouses, hire teachers, pay their salaries and enforce the attendance.

In 1877, the Coppino reform amended the electoral system established by the Casati law, the main contribution of it consisting in raising the compulsory years of schooling from two to three. In addition, it introduced the possibility for municipal councils to receive subsidies for building schoolhouses and furnish didactic material, it established sanctions for households not complying with the rule of law and, more in general, it enhanced the power of local councils to enforce compulsory attendance, above all in the

[6]See also Vasta [1999].

rural and less developed areas of the country. This reform was followed by the Nasi and Orlando laws, approved respectively in 1903 and 1904, which further raised the age of mandatory education and increased teachers' salaries, blocked since 1886 (see Cives [1990]). In 1906, the Special law for the South of Italy was enacted, including a set of reforms concerning schooling, aimed to bridge the socioeconomic gap between northern and southern regions. Although all these reforms contributed to improve the education system since the introduction of the Casati law, none of them dramatically boosted human capital in a decisive way.

A further crucial step ahead was taken with the introduction of the *Daneo-Credaro* law in 1911, following the Corradini Inquiry published one year before. This reform significantly changed the education system in Italy, centralizing the funding of schooling to a large extent. The main characteristic of the reform was constituted by the creation of the provincial school boards, the so-called *Consigli Scolastici Provinciali* (CSP), which worked as a link between municipalities and the central government. Indeed, on the one hand, they limited the power of the municipal councils, whereas on the other hand, they allowed a certain degree of administrative decentralization in the management of public resources. While municipalities could apply for free loans in order to fund the management of the construction of schoolhouses, the state was responsible for paying teachers' salaries. Moreover, municipalities included in the CSP system were obliged to transfer an amount of money equal to the previous years' budget to the Treasury. The state would in turn retransfer these funds to the CSP, which were charged with the task of financing public education (see Cappelli [2015], for further details).

1.3.3 The agrarian structure of the italian economy

Italy, soon after Unification, was a predominantly rural economy. In 1911, according to the Population Census, the share of agricultural employment over the total labor force was about 60%, and it remained relatively unchanged until the Second World War (see Felice [2018]). A slow process of industrialization was taking place in the surroundings of the so-called "industrial triangle", perhaps due to better resources endowments, higher literacy rates and a better access to European markets[7], but it was only confined to few cities and it did not trigger the development process for the rest of the country. Since the first years after Unification, land inequality has always been considered one of the

[7]For a more comprehensive study on the origins of the industrialization process in the North-West of Italy, see A'hearn [1998] and Missiaia [2016].

main issues at the core of political projects aimed at improving the conditions of the southern economy. The debate around *latifundia* involved prominent scholars such as Gramsci, Nitti, Sereni, Croce, ecc., at least as late as the implementation of the land reform after the Second World War.

First of all, land inequality is a measure of wealth dispersion *per sè*, whose observation contributes to shed light on the level of concentration of resources among the population. Second, in a prevalently agrarian economy, land constitutes the main productive input that, if highly concentrated in the hands of few landowners, can lay the foundations for the creation of an oligopsony in local labor markets. In such a situation, the mass of rural laborers loses bargaining power and is left with the only alternative to migrate, looking for better conditions outside agriculture. Large landowners' interest, then, will be to keep wages low, trying to impede the migration process and to maintain a huge mass of labor force at disposal. It was in this context that agricultural workers began to adhere to unions and political organizations in the beginning of the twentieth century, demanding higher wages and improved job conditions. A parliamentary inquiry on the conditions of Southern peasantry (Faina [1909]) raised concerns on the role of seasonal and chronic underemployment, attributed to the extensive agriculture based on grain cultivations in *latifundia* areas. The social conflict in the countryside increased after the first World War, leading to frequent occupations of idle land in many large estates. One of the main requests of workers' turmoil was a minimum level of yearly employment, called *imponibile di mano d'opera*. The protest movement drew to a close with the rise of Fascism in October 1922, after two years of violent upheaval.

Traditional historical literature considered *latifundia* negatively, attributing them one of the profound causes of the backwardness of the South. Large landowners were considered absentee and not rational economic agents, being more concerned with rent extraction than undertaking productive investments on their land. The Marxist scholar Sereni summarized the traditional view in his seminal work (Sereni [1971]), highlighting the detrimental role of "feudal" heritage and persistent underdevelopment in southern agriculture. Sharecropping agreements in the central part of the peninsula also reflected a low level of productive agriculture in the italian countryside. Only the capitalist farming in the Po Valley reflected a higher level of modern and advanced productivity in the primary sector, even though not sufficient to support modern economic growth for the country as a whole.

A more recent brunch of literature revised the traditionalist view. Specifically, the

hypothesis of southern large landowners' irrational behavior has been called into question (Petrusewicz [1989], Placanica [1990]). Their decisions were attributed to the existence of specific non-removable constraints they were facing, different from the ones landowners were to address in the Po valley. Even contractual agreements defining labor relations between peasants and landowners are now considered efficient solutions to specific principal-agent problems, stemming from different environmental conditions typical of southern countryside, such as drought in the summer, lack of rain and the presence of malaria (Galassi and Cohen [1994], Bevilacqua [1989], Lupo [1990]).

Although the existence of an entrenched controversy and long-term debate on the role of land inequality in the North-South divide in Italy, there have been no attempts to integrate the discussion with quantitative evidence for the Post-Unification period. I try to fill this void by relying on a proxy for measuring it, that I employ to assess its correlation with human capital accumulation. Hence, I focus on one specific component of the development process, leaving aside other possible channels through which land inequality is capable to influence long-run economic growth, such as efficiency in agriculture (Deininger and Squire [1998]), excessive taxation (Persson and Tabellini [1994]), trade policy that protects rent extraction (Adamopoulos [2008], extractive institutions (Acemoglu et al. [2002]), and market power (Martinelli [2014]).

In the next section I describe the main variables employed in the empirical analysis.

1.4 Data

I rely on a newly assembled dataset that includes information on both a proxy for the level of land inequality and for human capital in Post-Unification Italy. I digitized data from various sources and referred to six points in time (1871, 1881, 1891, 1901, 1911, 1921) for the 69 provinces and to only three points in time (1881, 1901 and 1921) for 205 districts (the latter allowing me to have a more detailed information), in order to test whether the concentration of landownership is associated with the expansion of education[8]. Data coming from Population Censuses contain a great deal of available information, including literacy rates, all tenancy contracts employed in agriculture and their percentage over the total labor force, territory surface and population. I integrated

[8]The Population Census was not conducted for the year 1891 because of financial issues. Therefore, I have estimated data for this year by means of linear interpolation.

this available information with other data coming from alternative sources. In particular, data on municipal expenditures, literacy rates for population aged more than 15, between 6 and 10 and between 15 and 19, the number of children and teachers, enrollment ratios in primary school and the number of schools divided by gender come from Bozzano and Cappelli [2019] and Cappelli and Quiroga Valle [2019], and are kindly provided by the authors.

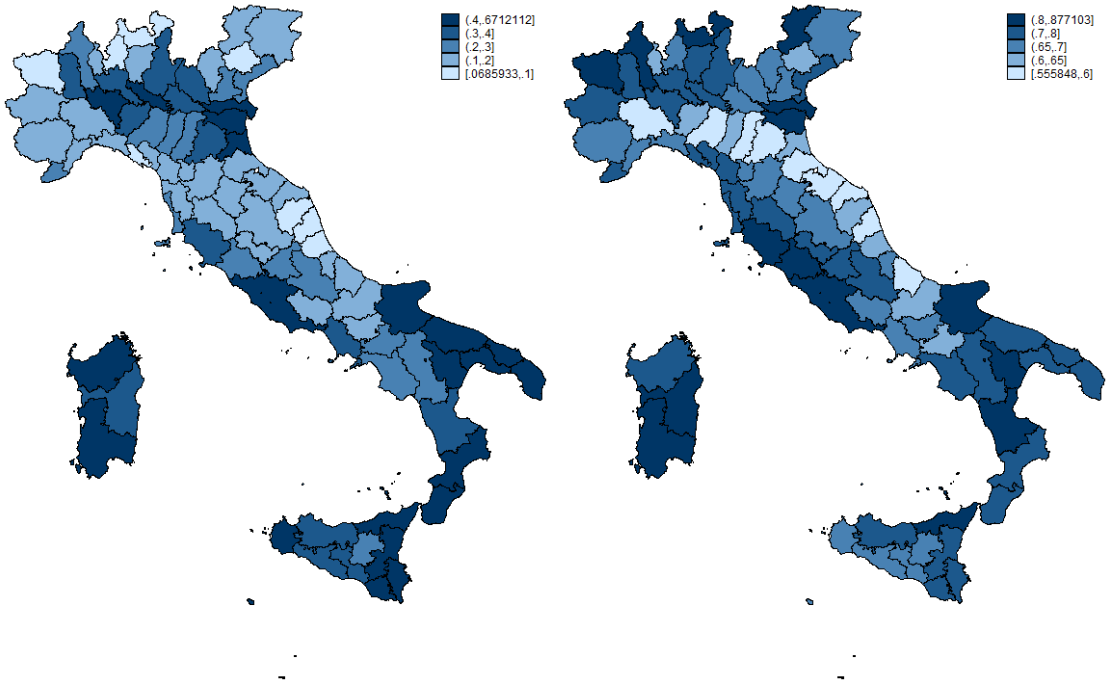
Since Population Censuses provide information on contractual agreements employed in agriculture, without including information on the size of landholdings, I cannot build up a proper measure of land inequality. Therefore, I follow Tapia and Martinez-Galarraga [2018], who argue that in this case the most adequate measure of the variable of interest is the fraction of farm laborers divided by the total labor force engaged in agriculture. In particular, the numerator includes the number of daily laborers, the so-called *braccianti*, and wage workers, generally hired at annual basis. These two agrarian figures constitute the mass of landless peasants opposed to the large landowners settled in the countryside. Hence, I expect the fraction of farm workers to be negatively associated with literacy rates. Furthermore, in order to show that my choice is correct, I also gathered data from the first Agricultural census, carried out for the first time by the Fascist Party in 1930, containing data on the number of farms divided by their size, from which I can construct a Gini index, the "true" measure of land inequality. Thus, I can compare it with my proxy for the same year, coming from the Population Census of 1931[9].

Figure 1.1 shows the variation of the two variables at stake. Both measures display a similar pattern and are highly correlated.[10]. A high share of farm laborers and land inequality for the interwar period is clearly evident in the plains of Maremma, in Tuscany, and Pontine marshes, in Latium, as well as in the well-known belt of southern *latifundia*, going from Apulia, passing through Basilicata and Calabria, and reaching some geographic areas of Sicily. The south of Sardinia and some parts of the Po Valley, especially near the Po delta, register high levels too. Thus, the evidence is much more mixed than expected, and there is a substantial variation throughout the peninsula. The positive association between the two measures is also shown in Figure 1.2. The

[9]This is the same measure obtained by Martinelli [2014] for 1940 at the very disaggregated level of "agrarian regions".

[10]In the absence of significant agrarian reforms, the unexplained variance of landownership concentration might be due to market forces that redistributed land. Nonetheless, land market remained steadily stuck until the Second world War, and no major changes occurred in landownership redistribution (see Petri [2002]).

Figure 1.1: Farm workers (share over total labor force in agriculture) [left] and Gini index for land inequality [right] in 1930.



Source: Author's elaborations on data coming from 1930 Agricultural Census and 1931 Population Census.

correlation index is about 0.48, and it reaches the level of 0.58 once I rule out from the sample Bolzano, Trieste, Trento and Gorizia, consistently with the sample size in liberal age, and Sondrio, Belluno, and Aosta, the three outliers that appear in figure 1.2, along with Trento. Indeed, typically in alpin areas, the Gini index is higher than the fraction of landless peasants working land. This could be due to the presence of big woods and forests owned by few large landowners. Consequently, measuring land inequality with my proxy may be misleading in similar areas.

Further, there might be some unobserved macroregional characteristics potentially distorting the correlation between the two variables, and ultimately making it lower than its true value. For this reason, I plot the same graph showing the level of correlation for each macroregion, in order to evaluate the association between the two variables *within* each macroarea of Italy (see figure 1.3). One concern can be raised regarding the circumstance of not capturing, using this proxy, the diffusion of land inequality if

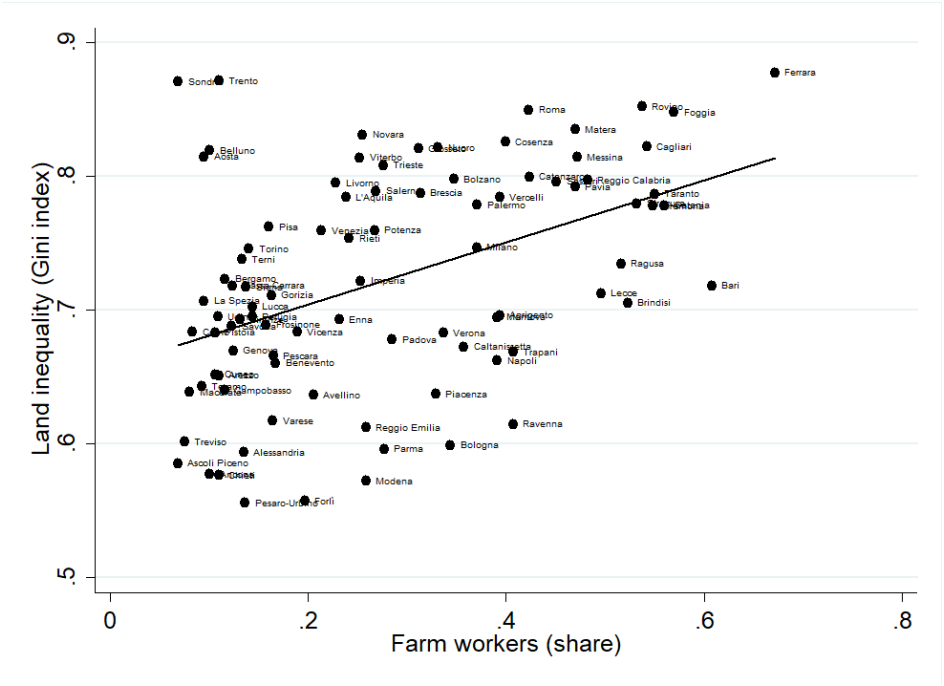


Figure 1.2: Correlation between the share of farm workers and the Gini index for land inequality, 1930.

other forms of agrarian regimes were prevalent, i.e. sharecropping activities, above all widespread in the central and north-eastern part of the country. Hence, one expects to find a lower association precisely in those geographic areas. Surprisingly, figure 1.3 seems to reject these hypotheses, highlighting the absence of macroregional features able to divert the relation between the presence of landless peasants and the Gini indicator of land inequality. On the contrary, the correlation is accentuated precisely in the center and north-eastern part of the peninsula, reaching, respectively, levels equal to almost 0.7 and 0.6[11]. Therefore, the comparison with the Gini index for land inequality in 1930 allows me to conclude that my proxy is suitable and it provides a reliable measure for landownership concentration.

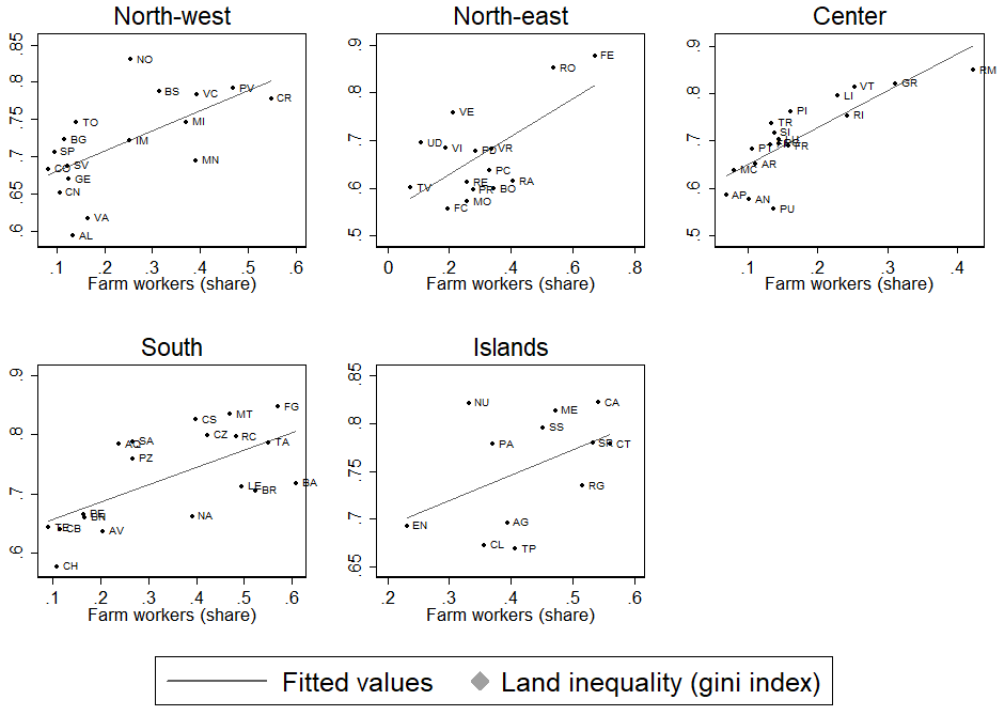


Figure 1.3: Correlation between the share of farm workers and the Gini index for land inequality in 1930 for each macroregion. Bolzano, Trieste, Trento and Gorizia are not included within the sample, consistently with the sample size in liberal age. The sample does not even count the other three outliers: Sondrio, Aosta and Belluno.

[11] In another exercise, I also regress the gini index and the fraction of farm workers on the percentage of sharecroppers and the macroregional dummies. The resulting residual predicted values remain highly associated. Results are available upon request, whereas the associated scatterplot is reported in figure 1.9, in the Appendix.

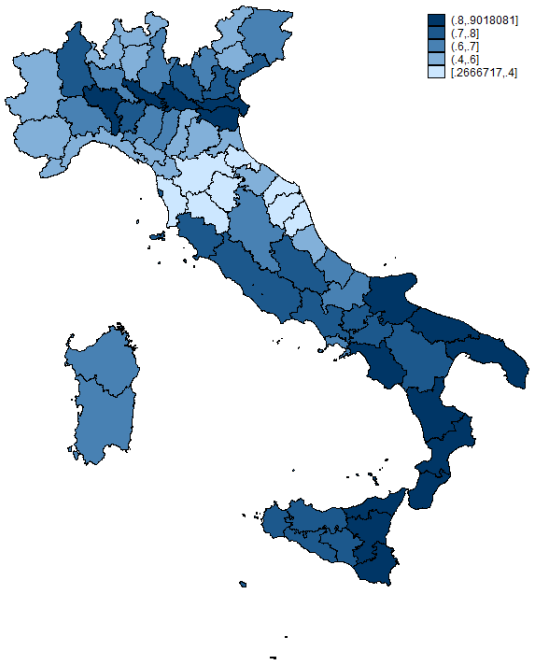


Figure 1.4: Farm workers (share over total labor force in agriculture) in 1881. Author's elaborations on data coming from 1881 Population Census.

In Figure 1.4, I report the share of farm laborers in 1881 (one of the years included in my sample). This map shows a pattern similar to the one displayed for the interwar period, confirming the slowly-changing nature of this variable and its stickiness over time. Although Figure 1.4 reflects what I expected to find about land inequality in Italy, it could be possible that those registered as landless actually owned some small plots of land, however not sufficient to ensure them to reach the subsistence level. Nevertheless, this type of rural worker was more prevalent where *braccianti* were less widespread, balancing the disparities in land inequality among regions. Moreover, farm workers had to rely on wage work and child labor in order to meet their needs, further incentivizing them not to invest in education, because of its opportunity cost. Generally, incentives to acquire education are associated to occupations that attach economic value to literacy skills, mostly widespread in urban areas. Indeed, towns and cities offered an easier access to schools and provided inhabitants with more opportunities to bump into market exchanges and frequent encounters with the law and the authorities. Therefore, it was indispensable to read and write bills of exchange and other trade documents. In contrast to urban areas, the countryside was mainly characterized by a less dynamic environment and it is likely that only local notables had access to education and the possibility to acquire literacy and numeracy skills.

Figure 1.5 plots literacy rates for Italy's provinces for a reference year in liberal age, 1881[12]. Literacy rates were much higher in the northwestern part of the country, coinciding with the so-called "industrial triangle", in the surroundings of Turin, Genova and Milan, the three most industrialized cities in Italy. Actually, although some disparities already existed between the North-West and the rest of the country at the Unification and in the first decades following 1861, the industrialization process was just beginning at that time and there were not noticeable disparities yet. Differences in the industrialization index would have enlarged from that period on, creating an even larger gap, particularly accentuated in the interwar period[13]. Remarkably, the North of Italy was not urban at all, with the exception of Turin, Milan and Genova, but was mainly constituted by sparsely-settled small towns, with a high number of small municipalities. These were characterized by the settlement pattern of the *cascina irrigua*, the typical

[12]Unfortunately, I do not have available shapefiles for the italian districts, which would have portrayed a more detailed representation of education levels.

[13]It is still debated whether the second wave of industrialization created incentives to invest in human capital or it was the other way around, namely that higher education levels paved the way for the industrial revolution in the circumscribed area of northwestern Italy. For further details, see A'hearn [1998] and Felice [2018].

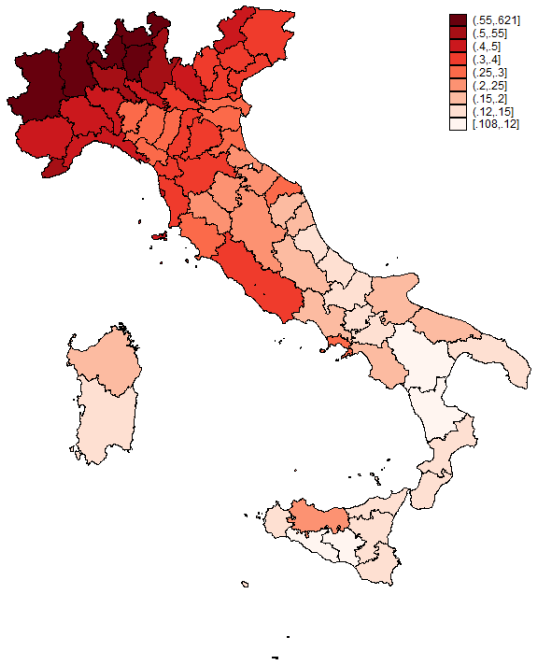


Figure 1.5: Literacy rate (1881). Author's elaborations on 1881 Population Census.

Po Valley agrarian regime, which favored the settlement of peasants close to their land. The highest urbanization rates are registered in some southern areas, mostly coinciding with the so-called *agro-towns*, composed by a huge mass of agrarian laborers settled on top of the hills and far from cultivated lands (Malanima [2005]).

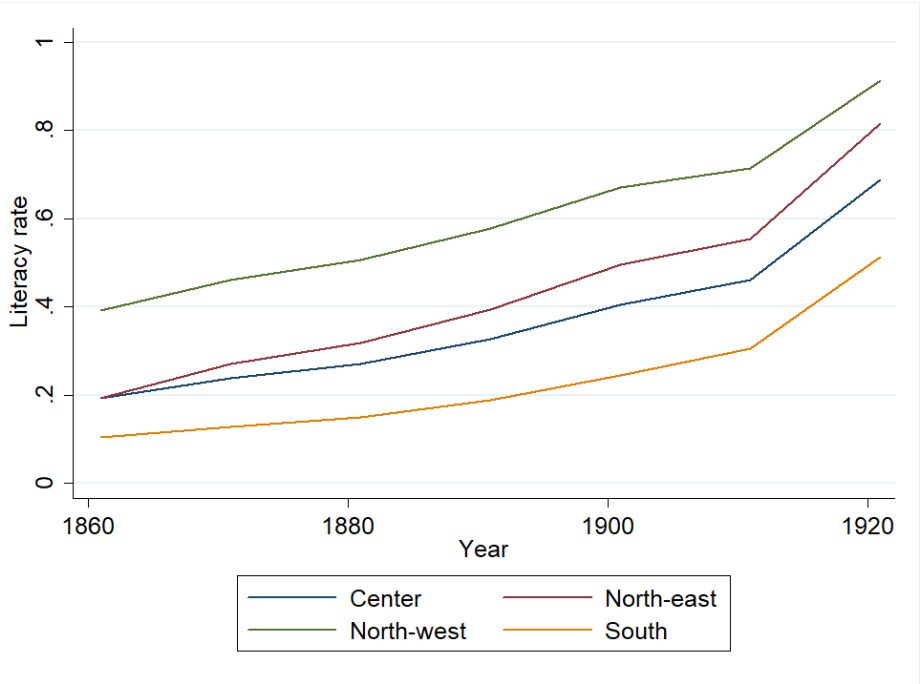


Figure 1.6: Literacy rate by macroregion (trend for the period 1861-1921)

Figure 1.6 displays the variation of literacy rates over time for the four main italian macroregions. Whereas the graph shows a clear North-South gap, it seems that literacy rates grew steadily at the same pace throughout the period under analysis. Neither divergence nor convergence seem to occur (or modest convergence rates), at least until the implementation of the *Daneo-Credaro* law. From that moment on, it seems that the speed rates for all italian regions would be enhanced, although the southern regions with a slightly more emphasized pace[14].

I test the hypothesis that the degree of landownership concentration is negatively associated with the level of human capital. A preliminary overview seems to confirm my

[14] In Appendix, graph 1.10, the trends over time for literacy divided by gender and the share of farm workers are shown.

conjecture, but the results can obviously be driven by some other omitted or unobserved factors related to both variables. Hence, in the next section, I try to rule out similar concerns by including additional controls and by implementing an identification strategy based on an instrumental variable approach. Further, I exploit the panel dimension of the dataset, by employing a stepwise *diff-in-diff* strategy. This allows me to account for structural reforms potentially related to the level of land inequality. The descriptive statistics referred to all the variables employed in the empirical analysis are reported in Tables 1.1 and 1.2, both for districts and provinces. For a thorough definition of the variables, as well as their source, see Table 1.17, in the Appendix.

Table 1.1: Summary of the variables: district-level

District-level	Mean	Median	Std.Dev.	10th perc	90th perc
Literacy	0.50	0.49	0.24	0.19	0.85
Literacy (rate)	0.56	0.54	0.22	0.27	0.88
Literacy (female)	0.45	0.44	0.26	0.12	0.84
Farm workers (share over total labor force in agriculture)	0.51	0.53	0.21	0.21	0.80
Population (log)	11.75	11.71	0.65	10.97	12.61
Urbanization rate	0.32	0.25	0.26	0	0.73
Latitude	47.14	47.77	2.90	42.23	50.49
Landlocked	0.56	1	0.50	0	1
Sharecroppers (share over total labor force in agriculture)	0.16	0.08	0.19	0.01	0.52
Agrarian labor force (share over total population)	0.39	0.39	0.12	0.24	0.53
Malaria 1880	0.30	0.21	0.29	0	0.77
Agrarian child labor (male)	0.24	0.23	0.08	0.13	0.34
Agrarian child labor (female)	0.16	0.15	0.10	0.03	0.30
Agrarian child labor	0.20	0.20	0.08	0.09	0.30
Obs.	615				

Notes: Descriptive statistics at district-level (average over the cosidered time span). Data for child labor and malaria are only available for 1881.

Table 1.2: Summary of the variables: province-level

Province-level	Mean	Median	Std.Dev.	10th perc	90th perc
Literacy	0.39	0.34	0.22	0.13	0.71
Literacy (male)	0.44	0.41	0.21	0.19	0.73
Literacy (female)	0.33	0.28	0.23	0.07	0.68
Farm workers (share over total labor force in agriculture)	0.52	0.53	0.20	0.24	0.79
Population (log)	12.89	12.87	0.55	12.28	13.60
Urbanization rate	0.17	0.12	0.17	0	0.42
Latitude	42.69	43.43	2.60	38.06	45.33
Landlocked	0.41	0	0.49	0	1
Sharecroppers (share over total labor force in agriculture)	0.19	0.10	0.21	0.02	0.57
Agrarian labor force (share over total population)	0.36	0.37	0.11	0.23	0.49
Malaria 1880	0.30	0.24	0.24	0.02	0.69
Child-teacher ratio	0.16	0.12	0.13	0.06	0.30
School density	0	0	0	0.00	0.00
Enrolment rate	0.35	0.31	0.16	0.15	0.60
Enrolment rate (male)	0.38	0.32	0.17	0.17	0.63
Enrolment rate (female)	0.32	0.29	0.15	0.14	0.56
Municipal expenditures (p.c.)	1.81	1.47	1.19	0.77	3.20
Domestic market potential	1331.63	1151.5	678	701	2550
Industrialization index	0.91	0.795	0.35	0.59	1.42
Mortality rate due to malaria	4.74	1.6	9.14	0.2	12.6
Agricultural productivity	87.40	78.5	28.24	59.9	145.5
Obs.	483				

Notes: Descriptive statistics at province-level (averaged over the considered time span). Data for enrollment rates and malaria are only available for 1881, malaria mortality only for 1901, agricultural productivity at regional level only for 1891.

1.5 Empirical strategy

In this Section, I evaluate the relationship between landownership concentration and literacy rates. First, I present OLS results from separate cross-sections at different points in time, both for districts and provinces in Post-Unification Italy. I proceed the analysis introducing an instrumental variables approach based on the presence of malaria, which aims at addressing the issue of potential endogeneity. Then, I corroborate findings presenting panel estimates that allow me to account for time-invariant unobserved heterogeneity. Next, I conduct a robustness check analysis by including further controls and trying to validate the instrument. Finally, I explore the mechanism of transmission of the effect by focusing on the effect of land inequality on some intermediate outcome-based measures of supply and demand of schooling.

1.5.1 OLS estimates

I estimate a standard OLS model where literacy rates are a function of the share of farm laborers in each district or province i:

$$Lit_{it} = \alpha_1 + \beta_1 LandIneq_{it} + \gamma_1 X' + \epsilon_{it}; \tag{1.1}$$

$\forall t \in 1871, 1881, 1891, 1901, 1911, 1921$, where Lit is the literacy rate, $LandIneq$ is the share of farm workers and β_1 the coefficient of interest. ϵ is the error term and X is a vector of socio-economic and geographical covariates which permits to control for other factors that may drive the results, being related both with education levels and with land inequality. These variables, indeed, capture other aspects of demand and supply of schooling potentially associated with landownership concentration. I include the level of population (in log), the urbanization rate, the share of sharecroppers over the total labor force in agriculture, and the fraction of people engaged in agriculture over the total labor force. In the absence of disaggregated data for GDP and GDP per capita for the period under analysis, the inclusion of these variables permits to account for opportunities outside agriculture that create an incentive to invest in human capital. Indeed, urban areas are typically more prosperous, as a more productive agriculture is able to sustain other activities where literacy skills are required. Following the same argument, the share of agricultural labor force is also included in order to distinguish between rural and urban geographic areas. Then, I expect it to be negatively associated with literacy rates. The proportion of sharecroppers allows me to control for areas in

which it is likely to register high land inequality levels that I do not take into account, given the way my proxy is constructed[15]. Furthermore, I also control for a dummy that takes on value one whether the district or the province is landlocked and zero otherwise, the latitude and four dummies for the italian macroregions. The first variable allows to capture the openness of local environment to trade and cultural flows, commonly due to a better access to sea, whereas the latitude controls for a diverse climate and temperature throughout the peninsula, potentially driving different agrarian regimes. Finally, the four departmental dummies allow me to capture most of the unobserved heterogeneity at a macroregional level.

The OLS results are presented in Tables 1.3 and 1.4, respectively at district- and province-level. The coefficient of interest is negative and statistically significant for all points in time in the period under analysis, both for the district and for the province estimates[16]. Furthermore, with regard to the estimates based on a more detailed level of territorial disaggregation (district-level), the magnitude of the coefficient appears to decrease over time, meaning that ongoing changes associated with landownership concentration had a role to reduce its impact on education levels. Therefore, even though OLS results are not conclusive, they suggest that the relationship between land inequality and literacy rates was likely to be more accentuated in the first stages of development. The share of the agrarian labor force, distinguishing between rural *vs* urban areas, shows a negative and statistically significant coefficient, as expected. The share of sharecroppers over the total labor force in the primary sector is negatively associated with literacy too, in line with the fact that only northwestern regions had higher levels of education. Latitude is positively associated with literacy, while other controls seem to be less relevant, apart from the dummy for being landlocked, positively associated in the provincial estimates.

Overall, while OLS estimates highlight a robust association between land inequality

[15] At each point in time, I find a negative correlation between the share of farm workers and the share of sharecroppers, meaning that they represent almost mutually exclusive tenancy contracts. At the same time, Martinelli [2014] highlights the presence of a high level of landownership concentration even in the case of the adoption of sharecropping agreements. In order to avoid any doubt, I opt for including the share of sharecroppers among baseline controls, given its ambiguous relation with the variable of interest.

[16] The low level of significance for 1871 may be due to measurement error, given the difference in the construction of the variable of interest. Indeed, tenancy contracts in 1871 Population Census are collected differently from other Censuses, and they may overlap with each other, producing different results.

Table 1.3: Literacy and farm workers, OLS (district-level)

District-level	1881	1901	1921
Farm workers	-0.2877***	-0.2009***	-0.1339***
	0.055	0.0378	0.0334
Agrarian labor force	-0.2798***	-0.4817***	-0.3057***
	0.0531	0.0482	0.0459
Population (log)	0.0266***	0.0165**	0.0086
	0.0098	0.0083	0.0076
Urbanization rate	0.0225	-0.005	-0.0144
	0.0203	0.0176	0.0213
Sharecroppers	-0.3130***	-0.2387***	-0.1437***
	0.05	0.0312	0.0408
Landlocked	0.0198**	0.0220**	0.008
	0.0097	0.0091	0.0095
Latitude	0.0174***	0.0208***	0.0200***
	0.0029	0.0033	0.0041
Departmental dummies	YES	YES	YES
Constant	YES	YES	YES
N	205	205	205
adj. R-sq	0.903	0.943	0.913
F	170.3	372.3	349.3

Notes: Robust standard errors are reported in parentheses for separate cross-sections. ***Significant at 1%; **significant at 5%; *significant at 10%.

Table 1.4: Literacy and farm workers, OLS (province-level)

Province-level	1871	1881	1891	1901	1911	1921
Farm workers	-0.1146*	-0.2943***	-0.3199***	-0.2539***	-0.2398***	-0.1476***
	0.0679	0.0938	0.0733	0.0502	0.0496	0.0462
Agrarian labor force	-0.1351	-0.2219**	-0.3699***	-0.3872***	-0.4131***	-0.3111***
	0.1131	0.0868	0.0772	0.0725	0.0789	0.0737
Population (log)	0.0109	0.0125	0.0058	0.0013	0.0026	0.0051
	0.0143	0.0143	0.0119	0.0108	0.0106	0.01
Urbanization rate	0.1493***	0.1001*	0.0596	0.0683*	0.0442	0.0054
	0.0553	0.0501	0.0384	0.0369	0.043	0.0437
Sharecroppers	-0.1564***	-0.3198***	-0.3149***	-0.2691***	-0.3286***	-0.1980***
	0.0535	0.0721	0.0484	0.035	0.0444	0.0435
Landlocked	0.0314*	0.0375**	0.0384**	0.0401***	0.0427***	0.0209
	0.0165	0.015	0.0144	0.0143	0.0135	0.016
Latitude	0.0152***	0.0136***	0.0130***	0.0145***	0.0153***	0.0201***
	0.005	0.0045	0.0041	0.0041	0.0041	0.0061
Departmental dummies	YES	YES	YES	YES	YES	YES
Constant	YES	YES	YES	YES	YES	YES
N	69	69	69	69	69	69
adj. R-sq	0.88	0.906	0.937	0.949	0.944	0.939
F	54.2	85.66	120.6	163.5	160.1	206.9

Notes: Robust standard errors are reported in parentheses for separate cross-sections. ***Significant at 1%; **significant at 5%; *significant at 10%.

and human capital in Post-Unification Italy, they still present several sources of endogeneity to be addressed, and the estimated coefficients cannot be interpreted as causal relations.

1.5.2 IV estimates: the role of malaria

The empirical evidence of the OLS regressions is mixed and inconclusive. The found coefficients do not reproduce a causal effect, as omitted unobserved factors correlated both with landownership concentration and literacy rates might bias the results. On the one hand, more educated peasants may be more able to rent plots of land that they can redeem, and then obtain better tenant conditions. This could be particularly true in a fixed-rent regime, ultimately resulting in a more equally distributed landownership. Conversely, more educated peasants may decide to sell their lands to seize better rents in occupations outside agriculture, with a higher payoff for high-skilled workers. This may lead to an increased level of land inequality. While in this latter case I eventually find a downwardly biased coefficient, in the first case the estimates may become upwardly biased toward zero. Thus, I address endogeneity by adopting an instrumental variable approach. Specifically, I exploit a new measure related to the presence of malaria in liberal age as a source of exogenous variation in land inequality.

Malaria and *latifundia* in the italian countryside

> *"Malaria is the basis of all social life. It determines relations of production and the distribution of wealth. Malaria lies at the root of the most important demographic and economic facts. The distribution of property, the prevailing crop systems, and patterns of settlement are under the influence of this one powerful cause."*
>
> Francesco Saverio Nitti

Malaria-endemic countries exhibit lower economic growth rates. The channels through which malaria prevents a country from undertaking a process of development are multiple, including effects on fertility, poverty, population growth, saving and investment, worker productivity, mortality rates and medical costs (Sachs and Malaney [2002]). Malaria is also seen to reduce labor force and impede the adoption of new technologies and practices in agriculture (see Asenso-Okyere et al. [2011] for a review). In Italy, during the last decades of the nineteenth century and the first half of the twentieth

century, malaria was considered one of the main political and socio-economic issues, because of its association with rural poverty and underpopulation (Amorosa Jr et al. [2005]). Malarial zones in Sardinia, in the Pontine marshes (*Agro Romano*), and along the coasts of *Mezzogiorno* were all characterized by low agricultural productivity and low population density (Celli [1933], Missiroli [1949]). Scarcely-populated and low-lying fertile areas stood in marked contrast to overcrowded and ecologically overexploited mountainous zones. With the fight against malaria, social planners aimed at triggering population growth and resettlement schemes in historically malarial zones. This strategy is a variation of the "vicious circle" argument which can be labeled the "Malaria Blocks Development" model (Brown [1983]). This model is based upon a theoretical backbone found at the turn of the twentieth century in the Italian public health literature on the interrelationship between malaria, population density and agricultural productivity. The effect on the settlement pattern of the population was therefore highly influenced by the presence of malaria. Even during the fascist period, Arrigo Serpieri, former Minister of Agriculture, asserted that a different geographical and social environment was needed in order to switch from an extensive to an intensive agrarian regime. He also added that *"(...)intensified cultivation systems are not possible where good and tolerable hygienic conditions are not determined before or in parallel with their introduction: many large estates are now infested with malaria, in front of which the current system has the great merit of not requiring the permanence in the countryside of several people, especially during the period of the most serious infection"* (my own translation from Boccini and Piccialuti [2003]).

The hypothesis that malaria endemicity is a driver of *latifundia* creation was originally suggested by Celli [1933]. More recently, it was tested by Chaves [2013], who uses Markov chain models to study the dynamics of *latifundia* creation in 1930 Spain. According to Celli, a high correlation between malaria endemicity and the creation of large estates is a pattern that has been observed for centuries in the Pontine marshes, a plain in the surroundings of Rome[17]. More specifically, it has been suggested and documented by the historical archives for the Roman Pontine marshes, that the debilitating effects of malaria on farmers do not allow them to harvest crops and properly cultivate lands. This induces peasants to sell their land, which will be then abandoned and purchased by few healthier and wealthier landowners. Then, large landowners will exploit land as *latifundia*, based on extensive and land-intensive agriculture, requiring

[17]The same pattern was observed in Spain in 1930s by Beauchamp [1988].

landless peasants' workforce. During harvest time, farm workers were then forced to settle in towns located on top of hills and far from infested areas. Idle lands reinforced the presence of *latifundia*, ultimately resulting in a vicious circle that maintained such a feudal agrarian regime for centuries.

In order to exploit information on the presence of malaria at a very disaggregated territorial level, I digitized the map *"Carta della Malaria dell'Italia"*, drawn by Luigi Torelli in 1882 (see figure 1.7), obtaining a proxy for its diffusion at province- and district-level[18]. To my knowledge, there exist no other similar historical data on malaria prevalence at such a high spatial resolution for pre-industrial Italy.

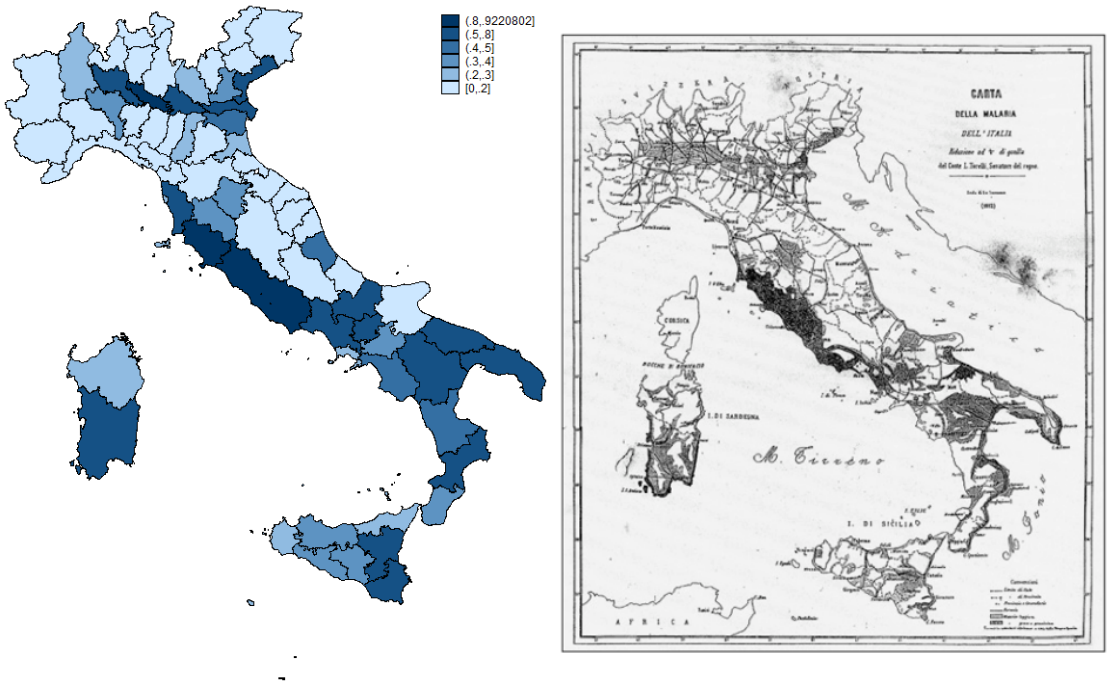


Figure 1.7: Digitalization of the *"Carta della malaria dell'Italia"*, Torelli map (1880).

The figure shows more than one similarity with the pattern observed for farm workers in the same year. As well as in the South and in the two islands, I find malaria

[18] A similar index was proposed by Buonanno et al. [September 2019] on the grounds of Torelli report. The authors compute a dummy variable taking on value 1 whether a municipality is affected by malaria and 0 otherwise. The digitalization of the map allowed me to obtain an even more detailed measure for malaria prevalence, computed as the share of geographic territory covered by the disease. The territory was divided in grid cells, then the variable has been reaggregated first at municipal and then at district- and province-level.

widespread in the areas of Maremma and Pontine marshes, in Tuscany and Latium, and in some provinces of the Po Valley. I claim that this measure is representative of the diffusion of malaria throughout Italy in all the time span of liberal age, even though it is observed in only one point in time and I am not able to exploit its panel dimension. Indeed, according to Snowden [2008], no remarkable changes occurred in the South until the Second World War, despite the introduction of quinine at the turn of the twentieth century, which somewhat reduced mortality due to malaria, especially in the North[19]. Moreover, I believe that mortality rates from malaria do not represent a proper proxy for the extension of the phenomenon. Indeed, like other parasitic diseases which are adapted to their hosts, malaria generally is associated to a low case-mortality ratio. Therefore, while the disease can contaminate a substantial percentage of the population, the number of deaths directly attributable to malaria endemicity account for only a small fraction of the overall annual mortality rate. For instance, in Sardinia before 1920, about 80% of a community suffered from malaria annually, whereas only at most 7% of deaths resulted from the disease (Brown [1983]).

I use the variable as an excluded instrument in all cross-sectional IV regressions at different points in time, both for districts and provinces. The first-stage regression is expressed by the following equation:

$$LandIneq_{it} = \alpha_2 + \beta_2 Malaria_{it} + X'_{it}\gamma_2 + u_{it} \tag{1.2}$$

where $LandIneq$ is the proxy for landownership concentration, $Malaria$ is the share of geographic territory covered by malaria, and X is the same vector of covariates included in the second-stage equation. The identification strategy hinges on the assumption that malaria endemicity affects literacy rates only through the level of land inequality. Nonetheless, if malaria is capable to influence agricultural productivity and crop mixes requiring different skills intensities, this would violate the exclusion restriction. Following the same argument, malaria could affect households' fertility decisions and variations of child labor in agriculture, keeping children out of school. This latter phenomenon might even be reinforced by the adoption of crops requiring high levels of skills and monitoring, inducing households not to invest in the education of their children. In light of these considerations, my estimates should be interpreted with caution,

[19] Malaria was finally eradicated with the introduction of DDT by American troops after 1944. Before its application between 1945 and 1950, a pattern of the diffusion of malaria endemicity similar to the one displayed for 1881 has been registered.

as a violation of the exclusion restriction may still occur. The results are reported in table 1.5 and in table 1.6 [20].

Table 1.5: IV estimates, district-level

District-level	1881	1st stage 1881	1901	1st stage 1901	1921	1st stage 1921
Farm workers	-0.4159***		-0.2426***		-0.2210***	
	0.1414		0.0551		0.058	
Agrarian labor force	-0.2944***	-0.0926	-0.4963***	-0.3451***	-0.3225***	-0.2493***
	0.0519	0.0672	0.0475	0.0753	0.0462	0.0822
Population (log)	0.0286***	0.0073	0.0162**	-0.0265**	0.0097	-0.0051
	0.01	0.0082	0.0081	0.0121	0.0073	0.0119
Urbanization rate	0.0252	0.0406	-0.0013	0.1287***	-0.0081	0.0762*
	0.0206	0.0311	0.0174	0.0434	0.0216	0.0414
Sharecroppers	-0.4097***	-0.7040***	-0.2614***	-0.4314***	-0.1860***	-0.3348***
	0.1051	0.0293	0.0341	0.0418	0.0458	0.0584
Landlocked	0.0215**	0.0175	0.0220**	0.01	0.0072	0.0009
	0.0101	0.0115	0.009	0.0178	0.0092	0.0179
Latitude	0.0156***	-0.0114**	0.0196***	-0.0209***	0.0191***	-0.0042
	0.0036	0.0045	0.0033	0.0069	0.0039	0.0079
Malaria 1880		0.1303***		0.2780***		0.2634***
		0.0217		0.0317		0.0371
Departmental dummies	YES	YES	YES	YES	YES	YES
Constant	YES	YES	YES	YES	YES	YES
N	205	205	205	205	205	205
adj. R-sq	0.9	0.783	0.943	0.755	0.909	0.574
F	167.7	141	371.1	89.66	287.3	35.3

Notes: 2SLS estimates. Robust standard errors are reported in parentheses for separate cross-sections. First-stage regression is reported for each year. *** Significant at 1%; ** significant at 5%; * significant at 10%.

The share of the surface covered by malaria is significantly and positively correlated with the fraction of farm workers both at province- and at a more refined district-level. The first-stage F-statistic is constantly high, confirming the validity and the power of the instrument, significantly related to the land ownership structure. Indeed, the values exceed the threeshold of 10 as a rule of thumb, ranging from a value of 10.01 to 22.52 for the case of provincial estimates and from 35.88 to 76.86 for districts[21]. Then, the

[20] See Figures 1.11 and 1.12 in the Appendix, in order to have a visual representation of the residual variation between land inequality and literacy rates and between malaria and land inequality, conditional on the baseline controls employed in the empirical analysis.

[21] Stock and Yoko tests and Sanderson-Windmeijer test confirm that the model is not weakly identified.

Table 1.6: IV estimates, province-level

Province-level	1871	1st stage 1871	1881	1st stage 1881	1891	1st stage 1891	1901	1st stage 1901	1911	1st stage 1911	1921	1st stage 1921
Farm workers	-0.2547		-0.3506**		-0.3215***		-0.2959***		-0.3569***		-0.2703***	
	0.1525		0.1721		0.1101		0.0801		0.1008		0.0961	
Agrarian labor force	-0.2119*	-0.4610**	-0.2420**	-0.2937**	-0.3707***	-0.3848***	-0.4019***	-0.2897	-0.4365***	-0.1659	-0.3272***	-0.1776
	0.1118	0.193	0.0929	0.123	0.083	0.1332	0.0729	0.1739	0.0816	0.1679	0.0773	0.1618
Population (log)	0.0126	0.0095	0.0137	0.0176	0.0058	0.0015	0.001	-0.01	0.0038	0.001	0.0098	0.0267
	0.0148	0.026	0.0146	0.0154	0.0119	0.019	0.0103	0.0299	0.0103	0.0194	0.011	0.027
Urbanization rate	0.1199**	-0.1637*	0.0937*	-0.0673	0.0595	-0.04	0.0689*	0.0549	0.0396	0.0072	-0.0012	-0.0351
	0.0573	0.0923	0.0502	0.0653	0.0386	0.0843	0.0361	0.1233	0.0451	0.0991	0.0448	0.0995
Sharecroppers	-0.2457**	-0.5608***	-0.3596***	-0.6519***	-0.3158***	-0.4823***	-0.2888***	-0.3692***	-0.3985***	-0.5016***	-0.2429***	-0.2132***
	0.1107	0.0632	0.1298	0.0412	0.067	0.0488	0.0467	0.0696	0.0721	0.0605	0.059	0.0775
Landlocked	0.03	-0.0027	0.0380**	0.0161	0.0385**	0.0156	0.0403***	0.0164	0.0419***	0.0054	0.0157	-0.0321
	0.0188	0.0319	0.0152	0.0161	0.0145	0.0219	0.0147	0.0317	0.0144	0.0288	0.017	0.0307
Latitude	0.0129**	-0.0131	0.0127**	-0.0126*	0.0130***	-0.0245***	0.0125**	-0.0405***	0.0110**	-0.0297***	0.0170***	-0.0154
	0.0059	0.0088	0.0051	0.0066	0.0046	0.0078	0.0053	0.0113	0.0053	0.0095	0.0058	0.0125
Malaria 1880		0.1950***		0.1476***		0.2154***		0.2795***		0.2402***		0.2985***
		0.0616		0.0404		0.0488		0.0637		0.0549		0.0629
Departmental dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	69	69	69	69	69	69	69	69	69	69	69	69
adj. R-sq	0.869	0.827	0.905	0.862	0.937	0.82	0.948	0.741	0.938	0.796	0.931	0.644
F	55.31	76.5	90.39	71.65	119.8	48.64	158.8	45.15	126.6	66.29	137.9	21.43

Notes: 2SLS estimates. Robust standard errors are reported in parentheses for separate cross-sections. First-stage regression is reported for each year. *** Significant at 1%; ** significant at 5%; * significant at 10%.

results confirm the significant negative relationship between the value of landownership concentration and human capital at the end of the nineteenth century and in the first years of the twentieth century in Italy. In terms of magnitude, if I increased by 1% the share of farm workers for the italian districts, I would find a literacy rate 0.41 percentage points lower in 1881, 0.24 percentage points lower in 1901 and 0.22 percentage points lower in 1921. In particular, consider the difference between the farm workers share in the districts of Noto and Lugo in 1881. In Lugo $LandIneq = 0.556$ (which is at the 25th percentile of the distribution of $LandIneq$ across districts in Italy) and in Noto $LandIneq = 0.8026$ (which is at the 75th percentile). Using the estimates in the first column of table 1.5, this implies that Noto's literacy rates in 1881 would have been almost 1% higher if it had a farm workers share as small as Lugo's. The coefficient magnitude is high for the provincial regressions too, ranging from 0.356% in 1911 to about 0.27% in 1921, even though inferior to the case of districts, plausibly due to the presence of unobserved factors I do not take into account, that make the parameters downwardly biased[22]. Overall, the IV coefficients are higher than the OLS coefficients at all points in time. The magnitude of the bias goes in line with the results obtained by Cinnirella and Hornung [2016] and Ramcharan [2010]. In fact, the authors find that IV results are more than three times larger than OLS estimates. The bias toward zero referred to the OLS results might arise because of several reasons, all summarized by the presence of unobservables only partially captured by the identification strategy.

As to the other control variables, the share of the total agrarian labor force, capturing opportunities outside agriculture and distinguishing between rural and urban areas, shows a negative and statistically significant sign, as expected. Interestingly, the negative relationship between sharecropping activities and human capital remains robust, although more modest in magnitude with respect to the variable of interest, unlike in the OLS framework. The macroregional coefficients (not reported for the sake of brevity) are alternate in significance, with northern areas positively associated with literacy rates, as well as latitude. Finally, the remaining control variables do not seem to be particularly related to literacy. Specifically, urbanization rates are not associated with more education, perhaps because of high levels registered in the South, due to the presence of the so-called *agro-towns*, as already mentioned in Section 1.4.

In Section 1.5.4, I also report the same estimates with the inclusion of the industrialization index, mortality rates due to malaria, agricultural productivity and the role

[22]The coefficient referred to 1871 is not statistically significant. See note 16 for a possible explanation.

of domestic market access. The latter may have favored education expansion thanks to closeness with markets and a more flourishing trade. Changes in the results are not significant, confirming the goodness of the model specification and the robustness of my identification strategy to potential factors invalidating the exclusion restriction hypothesis. Moreover, I go even further by undertaking two falsification tests: the first consisting in a reduced form regression of literacy rates on the indicator for malaria, and the second one allowing for a deviation from the perfect exogeneity assumption. Before doing so, in the next subsection I exploit the panel dimension of the dataset.

1.5.3 Panel results

Once the panel dimension of the dataset is explored in order to estimate the within-province and within-district relationship between changes in land inequality and literacy rates, the results I find are very similar. The advantage I have is twofold: the possibility to take into account all the unobserved time-invariant heterogeneity potentially correlated with the land ownership structure (fixed effects), and all the time shocks common to all units of observation that can potentially produce changes in the variable of interest and then affect education levels (time shocks). Further, I let interact land inequality with time dummies to account for institutional shocks common to all units, which could have determined a change in the political power of the landowning elites, in the vein of a stepwise *diff-in-diff* approach. The corresponding equation assumes the following form:

$$Edu_{it} = \alpha_i + \delta_t + \sum_t \beta Land_{it}\delta_t + \sum_t \gamma X'_{it}\delta_t + \upsilon_{it} \tag{1.3}$$

where Edu are literacy rates (overall and by gender), α_i and δ_t are, respectively, fixed effects and time shocks, while $X'_{it}\delta_t$ represent the interaction between baseline controls and time dummies. My variable of interest is represented by the interaction term $\sum_t \times \beta Land_{it}\delta_t$; finally, υ_{it} is the error term. I am primarily interested in β's.

Results are reported in Tables 1.7 and 1.8, both for districts and provinces. As mentioned above, I opt for a model specification in which all regressors are interacted with time dummies, in order to account for their marginal effect to change over time (see Cinnirella and Hornung [2016] and Cappelli [2016]). This is due to the different nature of my variables: literacy rates follow a constant increasing trend, while the fraction of farm workers appears to be slowly-changing, only showing remarkable geographical

Table 1.7: Panel results: district-level

Panel results: district-level Dep.var.:	Literacy	Literacy (male)	Literacy (female)
Farm workers x 1901 dummy	-0.0989***	-0.0239	-0.1658***
	0.0355	0.0316	0.0436
Farm workers x 1921 dummy	0.0471	0.1418***	-0.0048
	0.0462	0.0422	0.0576
Controls (interaction terms)	YES	YES	YES
Constant	YES	YES	YES
Time dummies	YES	YES	YES
Fixed effects	YES	YES	YES
N	615	615	615
adj. R-sq	0.953	0.951	0.942
F	425.5	344.7	379

Notes: Fully-flexible district-level panel estimates. The share of farm workers is interacted with time dummies for the years 1881, 1901 and 1921. The omitted reference year is 1881. Baseline controls are interacted with time dummies. Robust standard errors are reported in parentheses. ***Significant at 1%; **significant at 5%; *significant at 10%.

differences *between* regions[23]. The sign of the coefficient referred to land inequality is negative and statistically significant in 1901 and not different from zero in 1921. As for the province case, with a longer time series, it begins to be significant in 1891, reaching a peak in 1901 and then decreasing subsequently. When I consider literacy by gender, the evidence is more mixed, and somehow inconclusive. In the district regression, while the impact on female literacy rates seems to follow the same path, the effect on male literacy rates is surprisingly positive and significant in 1921. On the contrary, in the province-case I find a negative and statistically significant effect throughout the considered time span bor both male and female literacy rates, despite the magnitude of the two coefficients becoming smaller over time. Overall, a comparison of the coefficients for the interaction terms indicates that districts and provinces exhibit a change over time in the relationship between landownership concentration and literacy, with the former becoming less and less influential, probably due to a weakening of the political power of local notables.

[23]For a visual representation of the trends in the main variables, see graph 1.10 in the Appendix.

Table 1.8: Panel results: province-level

Panel results: province-level Dep.var.:	Literacy	Literacy (male)	Literacy (female)
Farm workers x 1881 dummy	-0.0648	-0.0473	-0.0874
	0.0433	0.0358	0.053
Farm workers x 1891 dummy	-0.1559***	-0.1025***	-0.2123***
	0.0428	0.0377	0.0519
Farm workers x 1901 dummy	-0.2223***	-0.1355***	-0.3092***
	0.0554	0.0468	0.0694
Farm workers x 1911 dummy	-0.1937***	-0.0731	-0.3136***
	0.0574	0.0496	0.0717
Farm workers x 1921 dummy	-0.1317*	-0.0327	-0.2305**
	0.0784	0.0682	0.0934
Controls (interaction terms)	YES	YES	YES
Time dummies	YES	YES	YES
Fixed effects	YES	YES	YES
N	414	414	414
adj. R-sq	0.972	0.977	0.962
F	187.4	246.7	158.4

Notes: Fully-flexible district-level panel estimates. The share of farm workers is interacted with time dummies for the years 1881, 1901 and 1921. The omitted reference year is 1871. Baseline controls are interacted with time dummies. Robust standard errors are reported in parentheses. ***Significant at 1%; **significant at 5%; *significant at 10%.

Similar results go in line with the "passive modernization process" Italy was experiencing at that time, with the imposition of a bunch of top-down public policies that, along with small changes in the land ownership structure, may have reduced its impact on education through time. If my conjecture is correct, the reforms of the end of the nineteenth century and of the beginning of the twentieth century changed to some extent the relationship between the landed nobility and the peasantry, and their incentives to invest in education. Indeed, the process of democratization and the achievement of political equality in Western European countries during the late nineteenth and early twentieth century was generally followed by rapid public policy changes. Lindert [2004]

defined it as "the 1880-1930 laboratory", and documents the historical proximity between franchise extension and public provision of education, increased spending in social transfers, labour market reforms and creation of income tax systems. Post-Unification Italy is part of this laboratory, as local governments were in charge of providing many pro-growth public goods, including education and healthcare, and their decisions were likely to have determined long-lasting regional variation in income per capita. The *Daneo-Credaro* bill, enacted in 1911, is only one example of similar top-down policies. Another fundamental structural break is the piecemeal enfranchisement process experienced in Italy at different stages, with the stepwise enlargement of the franchise for male people as late as 1919. As said, all these institutional shocks might have weakened the political power of landowning elites, thus limiting their ability to intervene in public choice in later stages of development. In this case, it is reasonable to expect such a variable to have had lesser explanatory power as regards human capital accumulation.

1.5.4 Robustness checks

Additional controls

In this Section, I address the problem of potential time-varying confounding factors that can bias previous results. By doing so, I carry out some robustness checks of the IV baseline specification including some additional controls that can affect literacy rates through their interaction with landownership concentration, again proxied by the fraction of farm workers over the total labor force in agriculture. The results are reported in Table 1.9 at provincial level[24]. For simplicity, I only report regressions for 1901, as all variables are available at this point in time and a comparison among different specifications is possible.

[24]Unfortunately, I do not have at my disposal these controls at district-level for each point in time.

Table 1.9: Robustness checks, 1901

Representative year 1901				
Robustness checks	1901	1901	1901	1901
Farm workers	-0.3263***	-0.2897***	-0.2908***	-0.2958***
	0.0936	0.0766	0.0828	0.0814
Agrarian labor force	-0.4031***	-0.4010***	-0.3571***	-0.3868***
	0.0750	0.0707	0.0983	0.0776
Population (log)	0.0017	0.0018	-0.0011	0.0021
	0.0101	0.0106	0.0107	0.0101
Sharecroppers	-0.2945***	-0.2851***	-0.2907***	-0.2886***
	0.0491	0.0455	0.0472	0.0470
Urbanization rate	0.0813*	0.0547	0.0653*	0.0716*
	0.0415	0.0374	0.0335	0.0366
Landlocked	0.0420***	0.0382***	0.0395**	0.0396**
	0.0154	0.0142	0.0149	0.0149
Latitude	0.0120**	0.0165***	0.0114**	0.0133**
	0.0056	0.0052	0.0052	0.0055
Mortality rate	0.0006			
due to malaria	0.0005			
Agricultural productivity		0.0003		
(Federico)		0.0003		
Industrialization index			0.0231	
(Ciccarelli Fenoaltea)			0.0233	
Domestic market potential				0.0000
(Missiaia)				0.0000
Departmental dummies	YES	YES	YES	YES
Constant	YES	YES	YES	YES
N	69	69	69	69
adj. R-sq	0.946	0.949	0.948	0.948
F	145.9	146.2	149.1	149.1

Notes: 2SLS estimates. Robust standard errors are reported in parentheses for separate cross-sections. ***Significant at 1%; **significant at 5%; *significant at 10%.

In the first column, I add mortality rates due to malaria, coming from "Statistica delle cause di morte" in 1900, the first year in which this information is available. According to Malaney et al. [2004], in areas characterized by high levels of malaria endemicity, its mortality burden generally falls most heavily on children less than five years of age. In such an environment, women devote most of their time and productive life to child-rearing activities. Not only does this exclude them from the active labor force, but more often it even discourages incentives to invest in human capital because such an investment is less likely to produce economic returns in the future. Such a cost is particularly substantial when relatively few of the children a household has invested in survive and progress through adolescence to adulthood. Nonetheless, including mortality rates due to malaria does not affect the results, revealing that differences in children mortality caused by malaria morbidity were not relevant in explaining literacy rates.

Further concerns regarding the exclusion restriction are addressed in column 2, by including a regional measure of labor productivity in agriculture, in order to control for heterogeneity in agricultural productivity[25]. Indeed, the presence of malaria can undermine land suitability, ultimately affecting crop mixes and the adopted agrarian regimes. The magnitude and significance of the coefficients are very similar to the estimates for 1901 in the IV baseline specification[26].

Moreover, a shift from an agricultural to an industrial economy, creating a suitable environment for commerce and trade, might cause heterogeneity in the incentives to invest in education. Then, I include a provincial industrialization index in column 3, coming from the work by Ciccarelli and Fenoaltea [2010]. In fact, high industrialized areas, coinciding with the provinces of the so-called "industrial triangle", are plausibly negatively associated with high land inequality levels, potentially capturing its effect on literacy rates. Nevertheless, once again, the coefficient of the variable of interest retains its significance and remains almost unaltered.

The same holds true once I add a measure of regional market access, coming from Missiaia [2016], to account for heterogeneity in opportunities to trade which require greater literacy skills. In her work, the author argues that only domestic market potential, representing the home market, shows a traditional North-South divide, whereas

[25]The regional measure of agricultural productivity is borrowed by Federico et al. [2007]. They compute it by dividing gross saleable production over total labor force engaged in agriculture. Unfortunately, values of agricultural productivity are not available at provincial or district-level.

[26]In an alternative specification (not reported for the sake of brevity), I also gathered information for provincial per-hectare yields for wheat and corn in 1871. Including crop yields to account for differences in agricultural productivity produces similar results.

once international markets are introduced, the South does not show remarkable disparities with the rest of the country. Therefore, I only use her proxy for domestic market potential, by adding it within the set of covariates. The estimates presented in column 4 with its inclusion reveal that the magnitude and significance of the main coefficient are virtually unchanged.

In sum, results from IV specifications provide evidence that areas with a high presence of farm workers, proxying a more concentrated land ownership structure, present low levels of literacy rates in Post-Unification Italy. Moreover, this empirical evidence seems to be robust to the inclusion of different controls and to a different set of observations (districts and provinces). Nonetheless, other omitted time-varying factors I do not observe may still violate the exclusion restriction hypothesis. Indeed, the effects of malaria on school attendance and performance may affect even more directly human capital accumulation. Bleakley [2010] finds a positive effect of eradication campaigns in terms of income and an increase in years of schooling, whereas Cutler et al. [2010] find support of a mixed but indicative effect only for female education, with no impact on male income and education values[27]. Substantial dropout rates are generated by high rates of school absenteeism, which are the result of the diffusion of the disease. Furthermore, a new and increasing brunch of research also points toward ways in which malaria can permanently affect cognitive performance of children (see Al Serouri et al. [2000], Holding and Snow [2001]). According to these studies, parasitemic children, for instance, score lower grades on certain tests than do non-parasitemic children. The long-term cognitive performance of a child may also be inhibited by its previous in-utero experience during the pregnancy of the malaria-infected mother (McCormick et al. [1992]).

Therefore, for all these reasons, I cannot conclude by arguing that the impact of land inequality on literacy is perfectly causal, as potentially unexplored factors violating the exclusion restriction hypothesis could still be at stake. Nonetheless, in the sext subsection I run some falsification tests in order to test the validity of my assumption.

[27] A further attempt to evaluate the direct role of malaria on human capital is the work by Kere et al. [1993], who estimated the lost of educational investment expenditures as a result of lost school days in Solomon Islands. With reference to the consequences of malaria eradication on education outcomes, Percoco [2013]provides further estimates at regional level in Post-War Italy, finding a positive effect.

Validating the instrument: falsification tests

As is common in an IV framework, although it is easy to assess whether an instrument is relevant, less obvious is the satisfaction of the exclusion restriction hypothesis. I try to provide the reader with some insight of the validity of my instrument, by undertaking a number of falsification tests.

The first is to run a reduced form regression of the literacy rates, the main outcome variable employed in the empirical analysis, on my instrument, i.e. the indicator for the presence of malaria in a territory[28]. Results are reported in table 1.10. Not surprisingly, the presence of malaria has a negative and statistically significant correlation with literacy rates in 1881. To verify that the effect is not spurious, I replicate the exercise by running other two regressions, dividing the sample in two subsamples with high and low values of the farm workers over total labor force in agriculture. Specifically, I consider the median of the variable of interest as the threshold value, which is 0.695 in 1881. Then, I run two regressions, one with values of the share of farm workers below 0.695, and another one with levels above the chosen cutoff value. In the former case, I find that the correlation between malaria and literacy rates is negative but not significantly different from zero. By contrast, the regression conducted over the subsample with high values of farm workers shows a negative and statistically significant correlation between the indicator of the presence of malaria and literacy rates. Moreover, the magnitude of the effect almost reaches the one shown for the whole sample (-0.04 against -0.005), this meaning that the significant correlation displayed in the baseline case is mainly driven by districts exhibiting a substantial landownership concentration. In other words, when the conditions for *latifundia* creation are not met, the presence of malaria is not a sufficient condition to have lower human capital levels.

The second and most reliable falsification test comes from the relaxation of the assumption that my instrument is strictly exogenous. As widely argued, several concerns can be raised on the validity and the strictly exogenous nature of my instrument. Hence, I relax the hypothesis that the presence of malaria is not correlated with other unobservables influencing literacy rates, that is, I argue that malaria is *plausibly exogenous*. Such a definition comes from the work by Conley et al. [2012], who present a simple and tractable test of conducting inference that is consistent with the hypothesis that the exclusion restriction does not hold exactly. Specifically, the authors assume

[28]For the sake of exposition, I only report the regression for the year 1881 at district-level, as it is possible to evaluate the contemporaneous correlation between malaria and literacy rates.

Table 1.10: Reduced form relationship between literacy rates and malaria indicator for high and low levels of land inequality (1881)

Validating the instrument Dep.var.: literacy	Reduced form	Reduced form with low land inequality	Reduced form with high land inequality
Malaria 1880	-0.0542***	-0.0070	-0.0436**
	0.0192	0.0498	0.0171
Population (log)	0.0256**	0.0208*	0.0243
	0.0103	0.0114	0.0159
Urbanization rate	0.0083	-0.0032	0.0305
	0.0216	0.0346	0.0284
Sharecroppers	-0.1169***	-0.1282***	-0.0929
	0.0371	0.0349	0.1818
Landlocked	0.0142	0.0363**	-0.0076
	0.0101	0.0150	0.0123
Latitude	0.0203***	0.0416***	0.0171***
	0.0030	0.0091	0.0038
Agrarian labor force	-0.2559***	-0.3086***	-0.2076***
	0.0575	0.0746	0.0786
Departmental dummies	YES	YES	YES
Constant	YES	YES	YES
N	205	102	103
adj. R-sq	0.893	0.884	0.904
F	161.4	91.42	85.09

Notes: OLS estimates. Robust standard errors are reported in parentheses. ***Significant at 1%; **significant at 5%; *significant at 10%.

that the instrument enters linearly the second-stage regression as a further control, and that it has a direct effect on the outcome variable. Hence, the associated coefficient, which is the parameter on which they make inference, is allowed to have a non-zero value, in contradiction with the exclusion restriction hypothesis. Based on two distinct approaches, the union-of-confidence intervals (henceforth, UCI), and the local-to-zero approach (Henceforth LTZ), they make prior assumptions on the true value of such a parameter, that I will call γ. In the first case, the support for γ is restricted to be an interval between two values, whereas in the second case further hypotheses are advanced

with respect to its distribution function[29].

Obviously, priors over γ centered at 0 may be inappropriate in this case, as the related literature suggests a negative effect of malaria on education. Further, the estimates of the reduced-form relationship between the presence of malaria and literacy rates where the percentage of farm workers is low provide consistent estimates of γ[30]. The results displayed in Figure 1.8 evidence that there is still a significant effect of landownership concentration on literacy rates, even allowing for plausible amounts of imperfect exogeneity. In the UCI approach (left-side), if I allow for γ to be negative and ranging from -0.01 to 0, the corresponding confidence set for β is approximately $[-0.6931; -0.0661]$, and remains negative at each value in the support of γ. As for the LTZ approach, we can clearly see that as soon as I let the direct effect to be greater than -0.01, the bounds of the confidence intervals for β go across 0, in line with the estimated value of -0.007 found in the reduced form regression, with low levels of land inequality. This means that priors consistent with beliefs above this threshold value are sufficient to lose confidence in the finding of a significantly negative effect of land inequality on education. By contrast, below this prior belief for γ, I find evidence that β still represents an economically important impact.

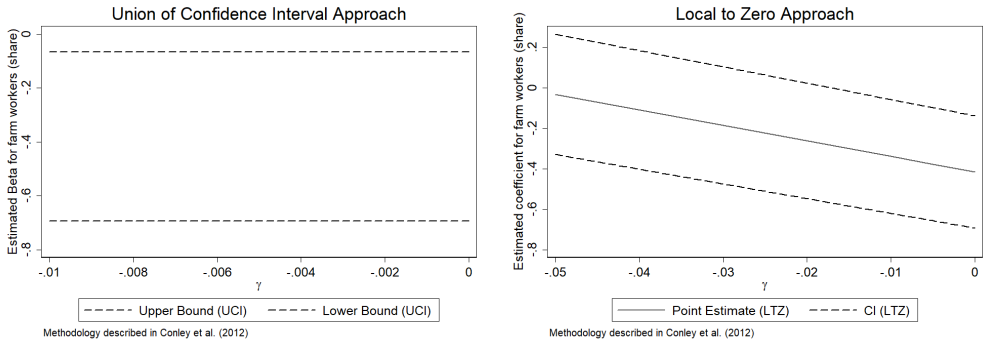
1.6 Mechanism of transmission: supply *vs* demand

Literacy rates represent a so-called equilibrium measure of human capital. Although I found a negative and statistically significant relationship with the share of farm workers, here proxying the level of land inequality, I do not know whether this impact runs through either a demand or a supply channel. On the one hand, an unequal landownership structure implies a more concentrated economic and political power in the hands of few large landowners. This is particularly interesting for my purpose, since local notables, who took over municipal councils, had the power to influence the decisions to invest in mass schooling (certainly until 1911) and prevent the majority of population from gaining power. On the other hand, a high fraction of annual and daily workers in agriculture, a social class owing few economic resources and facing a binding budget

[29] For a broader and more detailed discussion, see Conley et al. [2012].

[30] Generally, the reduced-form captures both the effect of β and γ. But if we are confident that β is zero, then it captures only the effect of γ. In this context, reliable values for γ are provided in the reduced-form with low levels of land inequality, that is, when β is almost-zero.

Figure 1.8: Plausibly exogenous test: 95% interval estimates



Notes: The figure presents 95% confidence intervals for the effect of farm workers (share over total labor force in agriculture) on literacy rates in 1881, at district-level. The definition of γ differs between the support-only intervals (UCI, left side) and the interval that uses the full prior (LTZ, right side). In the first approach, I let γ to assume a range of values between -0.01 and 0, while in the LTZ approach, I impose a normal distribution with mean equal to -0.025 and variance 0.00001.

constraint, had lower incentives to invest in human capital, given its low payoff and their uncertain long-term returns.

As discussed in Section 1.1, Galor et al. [2009] assert that human capital is complementary to industry-related tasks, mostly widespread in urban and industrialized areas, whereas rural labor force is not required to possess literacy skills. Thus, large landowners' stake was to reduce and possibly oppose human capital-enhancing institutions, in order to limit migration and maintain agricultural wages low. By contrast, capitalists were in favour to support institutions promoting education. Since landed nobility in rural areas was liable for the construction of schooling infrastructures, the appointment of school teachers and the management of municipal fiscal resources, I employ these intermediate outputs proxying the supply of schooling in order to test whether landowning elites were able to block expanding the provision of education where they had a greater political power. Specifically, I exploit information on the child-teacher ratio, school density, and municipal expenditures per capita aggregated at provincial level.

In addition, I gather information on enrolment rates and child labor, in order to assess the role of rural households' demand for education. Since I only observe this information in 1881, I can barely run IV regressions, without the possibility to exploit

the panel dimension of the dataset. Furthermore, information at a more detailed district-level are only available for child labor, while enrolment rates are uniquely observed at provincial level[31].

The baseline specification reports IV estimates, employing malaria as an excluded instrument and including the set of baseline controls[32]. Despite the fact that these variables aim to proxy supply and demand factors, they are somehow endogenous. In fact, a larger number of teachers appointed to school and a higher level of school density may induce children to attend school. Conversely, higher enrolment rates, capturing children demand to go to school, may boost the supply of schooling. The same argument applies to municipal expenditures per capita, which may be greater where the demand for education is higher. Nonetheless, assessing the impact of inequality on these schooling outputs remains highly informative *per sè*.

The results are reported in tables 1.11, 1.12, 1.13 and 1.15. I find a positive and statistically significant association between the level of land inequality and the ratio between children and teachers. This suggests that where landownership was more concentrated, the number of teachers appointed to schools was lower, perhaps as a result of a minor effort to expand education. More importantly, the significance does not vanish over time, meaning that the positive correlation is robust to changes occurred in the considered time span. When I deal with school density, I find a negative association, though not statistically significant[33]. This means that disparities in the construction of schoolhouses between areas with greater and lower levels of landownership concentration had been almost non-existent as late as the rise of the Fascist party. The effort spent to build them up appears to be the same across Italy's municipalities[34]. Again, when it comes to investigate the relationship between my measure of inequality and the value of municipal expenditures per capita in every province at each point in time, I find no evidence of a systematic significant correlation[35].

The sufficient cross-sectional and time variation allow me to conduct panel estimates for all the three variables. Although I am not allowed to consider the presence of malaria

[31]For further information about the definition and measurement of the variables referred to the supply and demand of schooling, see Table 1.17, in the Appendix.

[32]I use the same specification as in table 1.5.

[33]I do not have available data referred to school density in 1871 and in 1921.

[34]Nevertheless, further concerns may be risen if the role of road infrastructures is taken into consideration. Indeed, following this argument, in the most disadvantaged and montainous areas they may have prevented a greater part of the population from easily reaching schoolhouses.

[35]I do not have available data referred to municipal expenditures referred to 1921.

Table 1.11: Mechanism of transmission: child-teacher ratio

Panel A Dep.var.: child-teacher ratio	1871	1881	1891	1901	1911	1921
Farm workers	0.442	0.5097*	0.3128**	0.2259*	0.2947**	0.1567**
	0.3659	0.2584	0.1556	0.1173	0.1413	0.0736
Agrarian labor force	0.3796	0.3630*	0.2706	0.2446	0.2097	0.1554*
	0.3732	0.2154	0.1928	0.1485	0.1532	0.0906
Population (log)	-0.0581**	-0.0477***	-0.0323***	-0.0285**	-0.0233**	-0.0206**
	0.0258	0.0152	0.0117	0.0121	0.011	0.0094
Urbanization rate	0.2055	0.1998*	0.1109	0.0565	0.0456	0.0539
	0.1987	0.1191	0.1055	0.0888	0.0919	0.0578
Sharecroppers	0.3206	0.4506**	0.2379**	0.1593**	0.2531**	0.0702
	0.2406	0.2012	0.1023	0.0762	0.1085	0.0691
Landlocked	-0.0097	-0.0168	-0.0112	-0.0103	-0.0087	0.0057
	0.0338	0.0215	0.0197	0.0219	0.0227	0.0197
Latitude	-0.0349	-0.0118	-0.0006	0.0028	0.008	0.0018
	0.0237	0.0123	0.0114	0.0116	0.011	0.0067
Departmental dummies	YES	YES	YES	YES	YES	YES
Constant	YES	YES	YES	YES	YES	YES
N	68	69	69	69	69	69
adj. R-sq	0.341	0.304	0.177	0.177	0.015	0.062
F	6.155	4.968	4.251	4.277	2.86	2.204

Notes: 2SLS estimates. Robust standard errors are reported in parentheses for separate cross-sections. *** Significant at 1%; ** significant at 5%; * significant at 10%.

Table 1.12: Mechanism of transmission: school density

Panel B Dep.var: school density	1881	1891	1901	1911
Farm workers	-0.0066	-0.0053	-0.004	-0.0021
	0.0078	0.0065	0.0049	0.0052
Agrarian labor force	-0.0127*	-0.0132	-0.0103	-0.0097*
	0.0072	0.0086	0.0063	0.0054
Population (log)	0.0003	0.0005	0.0005	0.0004
	0.0007	0.0006	0.0005	0.0006
Urbanization rate	0.0057***	0.0048**	0.0056**	0.0054*
	0.0021	0.0021	0.0024	0.0028
Sharecroppers	-0.0047	-0.0017	-0.0004	-0.0002
	0.005	0.0031	0.0022	0.0032
Landlocked	0.0002	-0.0001	-0.0001	-0.0001
	0.0005	0.0005	0.0005	0.0005
Latitude	0.0007**	0.0006*	0.0005	0.0007**
	0.0003	0.0004	0.0003	0.0004
Departmental dummies	YES	YES	YES	YES
Constant	YES	YES	YES	YES
N	69	69	69	69
adj. R-sq	0.353	0.283	0.301	0.306
F	4.361	5.233	5.969	3.507

Notes: 2SLS estimates. Robust standard errors are reported in parentheses for separate cross-sections. *** Significant at 1%; ** significant at 5%; * significant at 10%.

Table 1.13: Mechanism of transmission: municipal expenditures

Panel C Dep.var.: municipal exp. (p.c.)	1871	1881	1891	1901	1911
Farm workers	-2.0457*	-0.2416	-0.1125	0.0216	-1.945
	1.1072	0.8706	0.7788	0.8669	4.1235
Agrarian labor force	-2.3869**	-0.0108	-0.4249	-0.6882	1.1905
	0.9633	0.6661	0.6479	0.5729	3.4919
Population (log)	-0.0788	-0.0822	0.0036	0.0869	-0.1026
	0.1163	0.0842	0.0981	0.1386	0.6679
Urbanization rate	0.0126	0.7303**	0.8521**	0.9879***	2.8745
	0.4569	0.3417	0.3314	0.3547	1.7959
Sharecroppers	-0.8741	-0.7895	-0.8071	-0.8035	-4.4107
	0.7962	0.6906	0.5461	0.5594	2.6667
Landlocked	-0.0947	0.0998	0.011	-0.0783	-0.0902
	0.1026	0.0766	0.0763	0.102	0.3674
Latitude	0.0077	0.0192	0.0309	0.0461	0.0087
	0.0389	0.0233	0.0298	0.0499	0.1466
Departmental dummies	YES	YES	YES	YES	YES
Constant	YES	YES	YES	YES	YES
N	69	69	69	69	69
adj. R-sq	0.23	0.572	0.658	0.632	0.113
F	6.989	15.53	17.95	13.76	3.466

Notes: 2SLS estimates. Robust standard errors are reported in parentheses for separate cross-sections. *** Significant at 1%; ** significant at 5%; * significant at 10%.

Table 1.14: Mechanism of transmission: panel estimates

Mechanism of transmission: panel			
Dep. var.:	Child-teacher	Municipal expenses p.c.	School density
Farm workers x 1881 dummy	-0.1693***	0.9177	
	0.0610	0.6797	
Farm workers x 1891 dummy	-0.2916***	0.9883	-0.0002
	0.0655	0.8289	0.0010
Farm workers x 1901 dummy	-0.2778***	0.1431	-0.0007
	0.0636	0.8913	0.0010
Farm workers x 1911 dummy	-0.3224***	-1.8672	-0.0001
	0.0663	1.6828	0.0010
Farm workers x 1921 dummy	-0.3556***		
	0.0759		
Controls (interaction terms)	YES	YES	YES
Time dummies	YES	YES	YES
Fixed effects	YES	YES	YES
N	413	345	276
adj. R-sq	0.588	0.679	0.483
F	11.55	45.58	11.13

Notes: Fully-flexible district-level panel estimates. The share of farm workers is interacted with time dummies for the years 1881, 1901 and 1921. The omitted reference year is 1871. Baseline controls are interacted with time dummies. Robust standard errors are reported in parentheses. ***Significant at 1%; **significant at 5%; *significant at 10%.

as exogenous instrument due to its lack of time variation, it is possible to account for unobserved provincial heterogeneity (fixed effects) and the presence of temporal shocks common to all provinces (time dummies). Further, I employ the same model specification as in table 1.8, with all regressors interacted with time dummies, in the vein of the already employed stepwise *diff-in-diff* estimation.

The results are reported in table 1.14. In the first column, they show a negative and statistically significant effect of farm workers on the child-teacher ratio. In addition, the impact displays an increasing trend in magnitude, ranging from -0.17 in 1881 to a value of -0.35 in 1921. At a first glance, the economic interpretation of such a result appears surprising and to some extent counterintuitive. This means that the effect of changes common to all the observations, potentially inducing an alteration in land inequality, is stronger in the provinces presenting a higher percentage of farm workers. Besides, its magnitude is even reinforced moving forward in time, thereby suggesting a remarkable and increasing role of the supply process in expanding public schooling. By contrast, columns 2 and 3 display results using municipal expenditures per capita and school density as outcome variables, showing a non statistically significant impact of the interaction between farm workers and time shocks. While in the latter cases the findings corroborate the results already shown in the IV specification, in the specification with the child-teacher ratio as outcome variable they are somehow in contrast to what previously found. Further research is needed in order to find out more on which supply factors mattered most in the transmission of the effect, if anything.

As said, while measures for outcome-based supply factors of schooling are available at different points in time for all the provinces, data for enrolment rates are only available for 1881. They are constructed by dividing people enrolled in primary schools over the total population aged between six and fifteen. In addition, it is possible to disentangle the variable by gender. Although the existence of a high level of correlation with literacy rates, enrolment rates should capture more accurately decisions to attend school, and then the demand for education. Indeed, while literacy skills are referred to the population as a whole, people enrolled in primary schools are prevalently children, thus only representing a population cohort. Therefore, at a first glance, they should mirror the decisions of the families to invest in their children's education. For the same reason, literacy endowment of a specific territory may represent the result of private agents' decisions undertaken years, or even decades before.

Table 1.15: Mechanism of transmission: enrollment rates

Panel D (1881)			
Dep. var.:	enrolment rates	enrolment rates M	enrolment rates F
Farm workers	-0.7531**	-0.6304**	-0.8771**
	0.3145	0.3048	0.3503
Agrarian labor force	-0.2651	-0.2347	-0.2971
	0.1697	0.1720	0.1812
Population (log)	0.0169	0.0068	0.0263
	0.0194	0.0207	0.0215
Urbanization rate	-0.1747**	-0.1114	-0.2361***
	0.0696	0.0721	0.0788
Sharecroppers	-0.6893***	-0.6171***	-0.7646***
	0.2196	0.2118	0.2467
Landlocked	0.0429	0.0476*	0.0386
	0.0273	0.0252	0.0318
Latitude	0.0153*	0.0146*	0.0161
	0.0089	0.0084	0.0100
Departmental dummies	YES	YES	YES
Constant	YES	YES	YES
N	69	69	69
adj. R-sq	0.826	0.813	0.810
F	43.85	35.38	43.17

Notes: 2SLS estimates. Robust standard errors are reported in parentheses for separate cross-sections. *** Significant at 1%; ** significant at 5%; * significant at 10%.

Unlike estimates with school density and municipal expenses as outcomes, land inequality negatively affects enrolment rates for every specification (overall and by gender). Moreover, the magnitude of the effect is stronger than the one on the outcome-based variables proxying supply of schooling. For instance, with respect to the regression with the child-techer ratio as outcome variable for the same year (table 1.11, column 2), the coefficient is 1.5 times higher. Unfortunately, differently from the case of the child-teacher ratio, here we cannot investigate the robustness of the correlation between the two phenomena by evaluating whether the effect vanishes over time.

Nevertheless, most often, the number of children enrolled at school does not coincide with the true proportion of children attending school. Absenteeism rates were high in depressed areas and law enforcement was not guaranteed. Since attendance rates are not observed for the period under analysis, I collected data at district-level on child labor in 1881 by gender, in order to proxy for the decision of families to send their children to work[36]. Indeed, child labor is the alternative to education. Doepke and Zilibotti [2005] propose a theoretical approach in which unskilled workers compete with children in the labor market, facing a tradeoff. On the one hand, unskilled workers support child labor regulations with the aim to raise their own wages. On the other hand, they oppose it when their own working children provide a large fraction of family income. Historically, it has been observed a preference for child labor regulations where the industrialization process already occurred, due to an increasing return to education. Hence, I expect a higher proportion of child labor to be associated with greater landownership concentration.

Table 1.16 reports the results using agrarian child labor as the main outcome variable, overall and divided by gender. When I do not distinguish by gender, regression outputs do not show any significant result. The positive and statistically significant impact is found once I account only for male child labor. This goes in line with the fact that only boys were completely devoted to working the land, albeit sometimes girls' involvement in agricultural tasks was likely to take place (see Tapia and de Miguel Salanova [January 2019]).

Finally, literacy rates are referred to the whole population aged more than six, thereby including people who could have acquired such a skill years before. In this

[36]Population Census in 1881 reports data on children performing all work duties. Nevertheless, I collect data only on children engaged in agricultural tasks, because of the fact that the total child labor coincides with the whole population aged between 9 and 15. Hence, it is not possible to distinguish between children enrolled in primary school and children involved in work duties outside agriculture.

case, the contemporaneous correlation with land inequality would say nothing about the presence of literate within a district or a province. For this reason, I move one step forward, by taking into account only people aged between 15 and 19 who have acquired literacy skills. In this case, the pattern of literate should represent the contemporaneous result of the decisions of households to invest in education, alternative to their decision to send their children to work. Following a similar argument, I expect land inequality to be negatively correlated with literacy rates computed for people aged between 15 and 19, as opposed to what I found for the agrarian child labor. Hence, I run regressions using this variable at provincial level as main outcome variable, finding a negative and significant effect of land inequality. Moreover, the results are robust to a different model specification (OLS, IV and panel regressions) and to different considered points in time[37]. In the panel regression, employing the usual stepwise *diff-in-diff* approach, it can be easily noticed how the effect of landownership concentration vanishes over time, along with its significance, in line with the modernization process of Italy.

Therefore, although these results do not sweep away the role of supply of mass schooling and of decisions of landowning elites in promoting it, they show evidence of the existence of other factors explaining the negative relationship between landownership concentration and education. These demand-based incentives may be linked to opportunities outside agriculture, to which payoff of literacy skills are attached, as well as to binding budget constraints of the rural population during this stage of development. Further research would enhance knowledge on the proper definition of such a mechanism.

1.7 Conclusions

Relying on an adequate proxy of land inequality in Post-Unification Italy, a uniquely assembled database both at district- and province-level offers the possibility to investigate whether and how landownership concentration affected literacy rates. I find that areas that exhibit higher levels of landownership concentration show systematically lower literacy rates throughout the period under analysis. Once the panel dimension of the dataset is explored, the magnitude and the significance of the effect decrease over time, in line with the "passive modernization process" hypothesis. Concerns referred to the omitted

[37]The results are reported in the appendix, tables 1.18, 1.19 and 1.20.

Table 1.16: Mechanism of transmission: child labor

Panel E (1881) Dep.var.:	Agrarian child labor M	Agrarian child labor F	Agrarian child labor
Farm workers	0.3375**	-0.0603	0.1506
	0.1312	0.1063	0.0921
Agrarian labor force	0.5235***	0.7096***	0.6146***
	0.0478	0.0463	0.0336
Population (log)	0.0093	0.0154**	0.0117**
	0.0089	0.0064	0.0059
Urbanization rate	-0.0215	-0.0097	-0.0163
	0.0246	0.022	0.0161
Sharecroppers	0.3294***	-0.1500*	0.0998
	0.1026	0.0861	0.0735
Landlocked	-0.0301***	-0.0234***	-0.0273***
	0.011	0.0087	0.0077
Latitude	-0.0026	0.0056	0.0015
	0.0044	0.0038	0.003
Departmental dummies	YES	YES	YES
Constant	YES	YES	YES
N	205	205	205
adj. R-sq	0.404	0.712	0.695
F	17.28	61.49	52.07

Notes: 2SLS estimates. Robust standard errors are reported in parentheses for separate cross-sections. *** Significant at 1%; ** significant at 5%; * significant at 10%.

variables and reverse causality are addressed by adopting an instrumental variable approach based on the presence of malaria morbidity. Under the strong assumption that malaria is exogenously determined, IV estimates corroborate OLS results, confirming a negative relationship between landownership concentration and literacy. Moreover, the results seem to be particularly robust to the inclusion of further controls, whose omission might have violated the exclusion restriction hypothesis, and to a different size of the sample (districts and provinces). Further, some falsification tests confirm the hypothesis of the causality of the impact.

Another important result is obtained when analyzing the mechanism of transmission of the effect. Although it is difficult to distinguish between supply and demand factors, land inequality may have adversely affected literacy rates not only by influencing the supply of schooling through the political process, but also through the private demand for education. Results employing several outcome-based measures of intermediate outputs of schooling supply and enrollment rates in primary schooling confirm this conjecture, showing that demand factors played an even major role in determining disparities in human capital accumulation. The results are confirmed once data on child labor in 1881 and literacy rates for people aged between 15 and 19 are employed in the empirical specification, showing that rural households preferred utilising the workforce of their children to perform work duties, rather than sending them to school. Thus, where land ownership was highly concentrated, the economic situation of the vast majority of rural population was extremely precarious and incentives to invest in education were beyond the binding budget constraints of large segments of the population. Furthermore, the opportunities to acquire literacy skills were limited because the possibilities of upward mobility were almost non-existent.

Therefore, although other explanations are not discarded, the findings of this work shed new light on the mechanism through which land inequality shapes different human capital accumulation paths, highlighting the role of malaria in creating and maintaining *latifundia* in the first place.

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1.8 Appendix

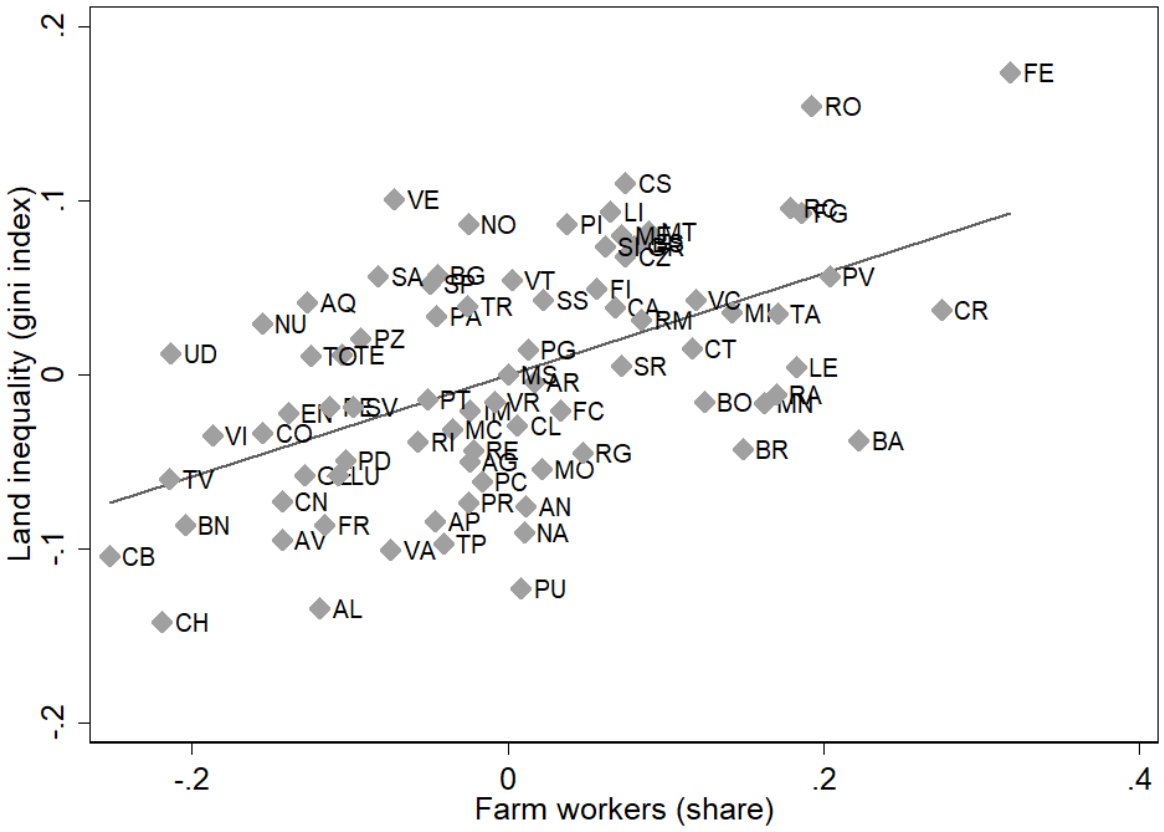

Figure 1.9: Correlation between the residual predicted values of the share of farm workers and the Gini index for land inequality in 1930, after controlling for macroregional dummies and the percentage of sharecroppers. Bolzano, Trieste, Trento and Gorizia are not included within the sample, consistently with the sample size in liberal age. The sample does not even count the other three outliers: Sondrio, Aosta and Belluno.

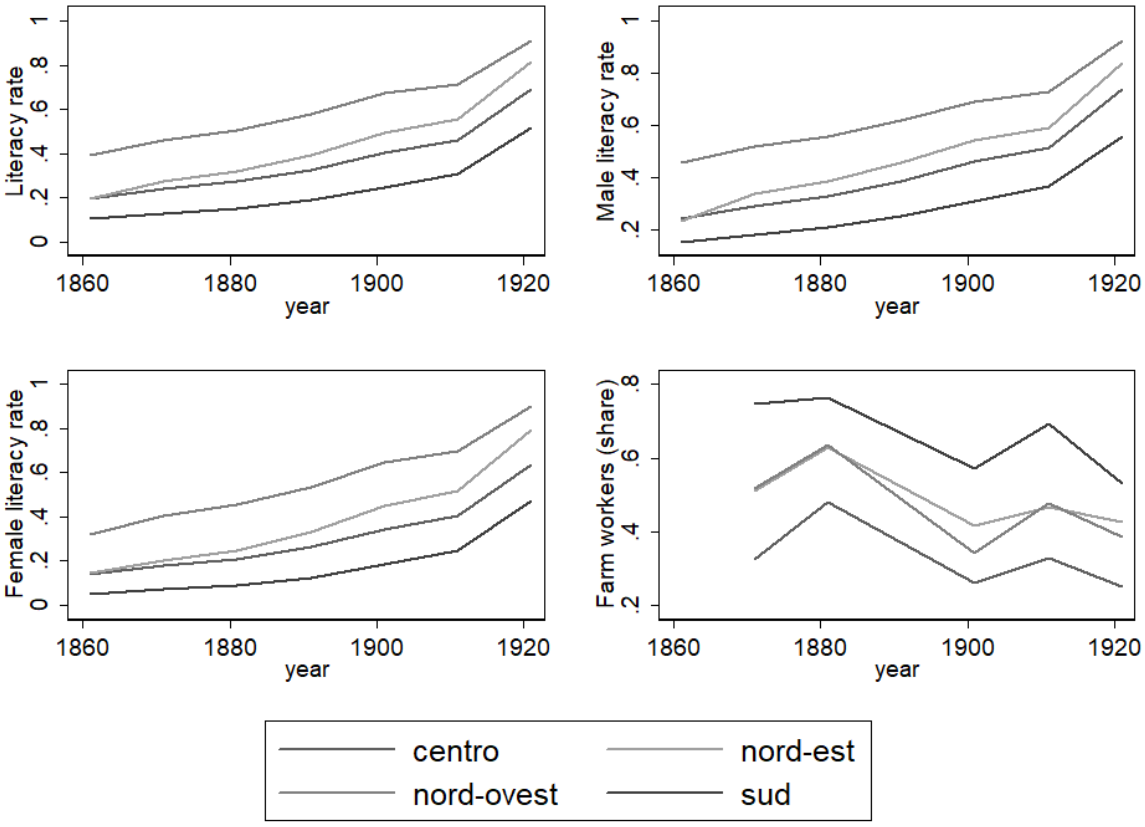

Figure 1.10: Literacy rate by gender and by macroregion, and share of farm workers over total labor force in agriculture (trend for the period 1861-1921)

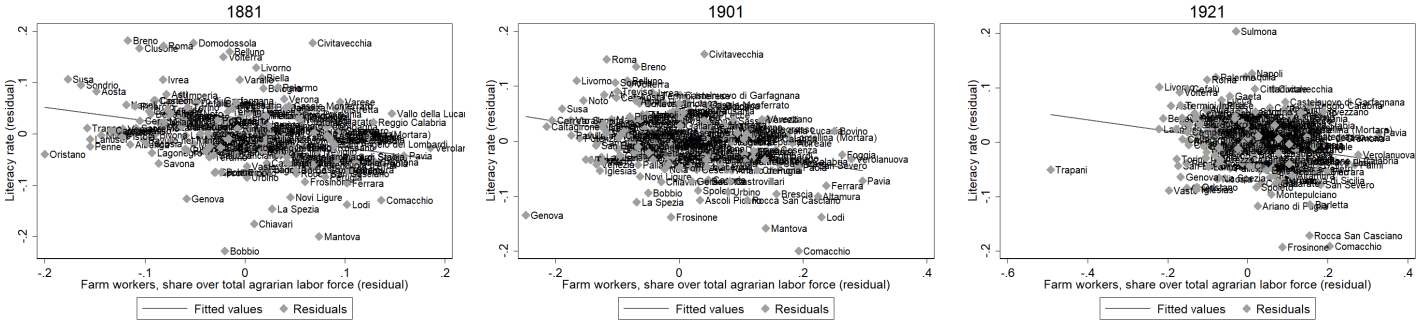

Figure 1.11: Each dot indicates a district in the sample. The y-axis in the three panels plots the residual variation in literacy rates in 1881 (left panel), 1901 (middle panel) and 1921 (right panel), after controlling for the baseline controls and the excluded instrument employed in the empirical analysis (see Tables 5 and 6). The x-axis plots the residual variation in land inequality, proxied by the fraction of farm workers over the total agrarian labor force, conditional on the baseline controls and the excluded instrument.

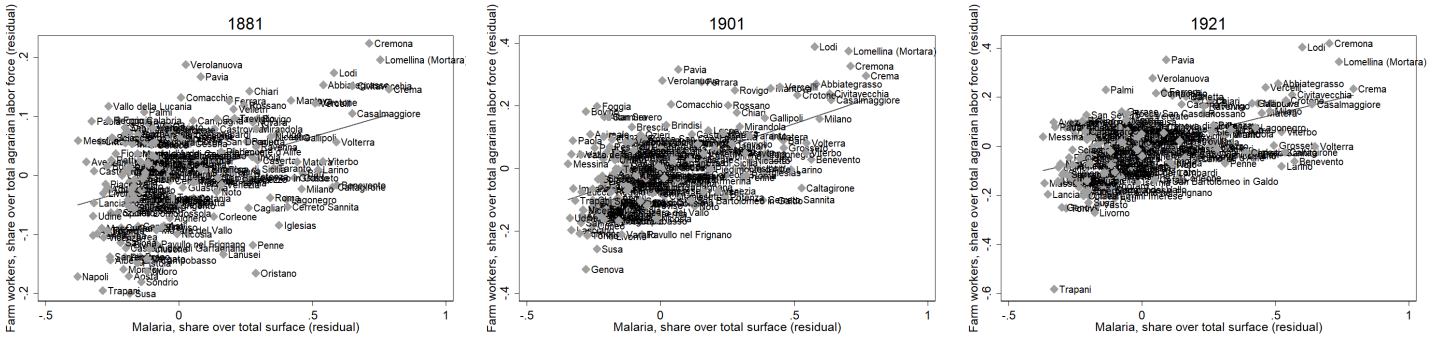

Figure 1.12: Each dot indicates a district in the sample. The y-axis in the three panels plots the residual variation in land inequality, proxied by the fraction of farm workers over the total agrarian labor force in 1881 (left panel), 1901 (middle panel) and 1921 (right panel), after controlling for the baseline controls employed in the empirical analysis (see Tables 5 and 6). The x-axis plots the residual variation in the presence of malaria, conditional on the baseline controls.

Table 1.17: Description of the variables

Variables	Description	Source
Literacy rate	Share of people >6 able to read and write	Population Census
Farm workers (share over the total labor force in agriculture)	Sum of daily workers (braccianti) and annual workers (salariati) over total labor force engaged in agriculture. For 1871 tenancy contracts overlap each other and are not perfectly comparable with Censuses of the subsequent years.	
Population (log)		
Urbanization rate	Fraction of population settled in cities >30000 inhabitants.	
Sharecroppers (share over the total labor force in agriculture)	Fraction of sharecroppers over total labor force engaged in agriculture	
Agrarian labor force (share over total population)	Share of labor force engaged in agriculture over total population	
Child labor (agrarian)	Share of people aged between 6 and 15 engaged in agriculture over the total number of people aged between 6 and 15	
Latitude		https://www.databasecomuni.it/
Landlocked		Author's elaboration.
Malaria 1880	Share of total territory covered by malaria.	Digitalization of the map "Carta della Malaria dell'Italia" by Luigi torelli.
Child-teacher ratio	Ratio between school-age children (males and females) and primary school teachers. (divided by 1000)	Data are kindly provided by the authors and come from Bozzano, Monica and Cappelli, Gabriele, "The legacy of history or the outcome of reforms? Primary education and literacy in Liberal Italy (1871 - 1911)", Working paper (2019) and Cappelli, Gabriele and Quiroga Valle, Gloria, "Schooling and literacy in the provinces of Italy and Spain, 1860 - 1920: new harmonised data", Mimeo (2019).
School density	Sum of public, private and mixed schools divided by the territory of each province.	
Enrolment rate	Number of children enrolled in public schools divided by the total number of school-age children.	
Municipal expenditures (p.c.)	Sum of municipal expenditures in education divided by the total population.	
Mortality rate due to malaria	Number of deaths caused by malaria fever over total deaths.	Ministero dell'Agricoltura, Industria e Commercio, "Statistica delle cause di morte", 1900. Roma, 1902.
Agricultural productivity	Gross saleable production divided by the number of agrarian employees (regional level).	Federico, Giovanni et al., "Ma l'agricoltura meridionale era davvero arretrata?", Rivista di politica economica 97, 3/4 (2007), pp. 317.
Crop yields	Per-hectare yields of wheat and corn (1878).	Ministero dell'Interno, "Annuario Statistico Italiano", 1878. Roma, 1878.
Industrialization index	Ratio between the share of added value, except construction sector	Ciccarelli, C and S Fenoaltea (2010). "Attraverso la lente d'ingrandimento: aspetti provinciali della crescita industriale nell'Italia post-unitaria". In: Quaderni di storia economica 4.
Domestic market potential	Market potential of region A: sum of the GDP of all the adjacent regions each weighted by their distance from region A	Missiaia, Anna (2016). "Where do we go from here? Market access and regional development in Italy (1871-1911)". In: European Review of Economic History 20.2, pp. 215-241.

Table 1.18: Literacy and farm workers, OLS (province-level)

Literacy 15-19: OLS	1871	1881	1891	1901	1911
Farm workers	-0.2223***	-0.5288***	-0.4635***	-0.3158***	-0.2691***
	0.0810	0.1183	0.0867	0.0571	0.0615
Agrarian labor force	-0.1854	-0.2663**	-0.4536***	-0.4423***	-0.3970***
	0.1425	0.1168	0.0992	0.0921	0.1025
Population (log)	0.0115	0.0236	0.0131	0.0101	0.0014
	0.0180	0.0187	0.0132	0.0123	0.0120
Urbanization rate	0.1715**	0.1133	0.0633	0.0575	0.0482
	0.0672	0.0730	0.0529	0.0500	0.0553
Sharecroppers	-0.2679***	-0.5650***	-0.4816***	-0.3892***	-0.3617***
	0.0618	0.0945	0.0628	0.0494	0.0650
Landlocked	0.0515**	0.0527**	0.0547***	0.0584***	0.0580***
	0.0212	0.0214	0.0191	0.0192	0.0213
Latitude	0.0203***	0.0175***	0.0190***	0.0239***	0.0237***
	0.0064	0.0064	0.0050	0.0052	0.0076
Departmental dummies	YES	YES	YES	YES	YES
Constant	YES	YES	YES	YES	YES
N	69	69	69	69	69
adj. R-sq	0.908	0.921	0.947	0.949	0.910
F	92.11	140.8	159.7	169.7	106.1

Notes: Robust standard errors are reported in parentheses for separate cross-sections. ***Significant at 1%; **significant at 5%; *significant at 10%.

Table 1.19: Literacy and farm workers, IV (province-level)

Literacy 15-19: IV	1871	1881	1891	1901	1911
Farm workers	-0.4933**	-0.7945***	-0.5881***	-0.4524***	-0.5132***
	0.2045	0.2455	0.1591	0.1232	0.1807
Agrarian labor force	-0.3339**	-0.3592***	-0.5106***	-0.4901***	-0.4458***
	0.1396	0.1257	0.1053	0.0948	0.1158
Population (log)	0.0149	0.0285	0.0137	0.0091	0.0038
	0.0198	0.0194	0.0128	0.0114	0.0130
Urbanization rate	0.1146	0.0847	0.0519	0.0593	0.0386
	0.0728	0.0740	0.0509	0.0497	0.0637
Sharecroppers	-0.4407***	-0.7530***	-0.5519***	-0.4533***	-0.5075***
	0.1477	0.1856	0.0988	0.0748	0.1229
Landlocked	0.0488*	0.0550**	0.0554***	0.0591***	0.0564**
	0.0258	0.0225	0.0197	0.0203	0.0222
Latitude	0.0159**	0.0133*	0.0154**	0.0176**	0.0147
	0.0079	0.0078	0.0067	0.0082	0.0099
Departmental dummies	YES	YES	YES	YES	YES
Constant	YES	YES	YES	YES	YES
N	69	69	69	69	69
adj. R-sq	0.888	0.914	0.944	0.944	0.894
F	74.57	84.31	132.8	162.9	81.73

Notes: 2SLS estimates. Robust standard errors are reported in parentheses for separate cross-sections. *** Significant at 1%; ** significant at 5%; * significant at 10%.

Table 1.20: Literacy 15-19 and farm workers, panel (province-level)

Mechanism of transmission: panel Dep. var.:	Literacy rate 15-19
farm workers x 1881 dummy	-0.2466***
	0.0714
farm workers x 1891 dummy	-0.2042***
	0.0756
farm workers x 1901 dummy	-0.1821*
	0.0916
farm workers x 1911 dummy	-0.0291
	0.1060
Controls (interaction terms)	YES
Time dummies	YES
Fixed effects	YES
N	345
adj. R-sq	0.932
F	86.16

Notes: Fully-flexible district-level panel estimates. The share of farm workers is interacted with time dummies for the years 1881, 1901 and 1921. The omitted reference year is 1871. Baseline controls are interacted with time dummies. Robust standard errors are reported in parentheses. ***Significant at 1%; **significant at 5%; *significant at 10%.

Chapter 2

Tenancy contracts, land inequality and social capital at the origins of the North-South divide in Italy

This paper investigates the historical determinants of social capital in Italy, widely seen at the root of the North-South divide. By focusing on the rural economic structure of Italy during the "liberal age" (1861-1911) and using several measures of social capital in the present-day, I find that areas that had a higher share of short-term contracts in agriculture exhibit lower civic capital today. The results are robust to the inclusion of a set of control variables. IV estimates using the presence of malaria as a source of exogenous variation rule out further concerns regarding the presence of potential endogeneity. I carry out also a spatial analysis to account for spillover effects, and the share of short-term contracts still retains its significance. Therefore, the effect is robust even after controlling for the fact that short-term leases were not randomly determined. Finally, I explore the role of the industrial districts as a mechanism to transmit the cultural trait of cooperation through time. As they took shape where short-term contracts were relatively rare, I find a positive association between municipalities exhibiting high civic capital and those being part of an industrial district.

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2.1 Introduction

The debate around the deep-rooted causes of the North-South divide is still in progress and seems to have had a new renaissance in the last decades, both in italian and international studies, in the fields of economics, history, sociology and anthropology. The so-called "Questione Meridionale" was brought to light in the late nineteenth century by Franchetti and Sonnino [1877] ("La Sicilia nel 1876"). Their work shed light on prohibitive living standards of the rural mass of the population in the South in the Post-Unification period (post-1861)[1]. In the subsequent years, the political debate involved prominent italian figures; yet, there is no consensus among scholars around the ultimate causes at the origin of South backwardness. Several explanations have been proposed by italian and international academics in the past and in more recent years, and they coincide with those emphasized in the global debate around the origins of the "wealth of nations": technology, geography, external exploitation, culture and institutions.

In the second half of the twentieth century, a growing number of foreign scholars participated in the literature around regional disparities in Italy, and gave more emphasis on the "cultural" explanation. Banfield [1967] and Putnam et al. [1994] stood out among them. They highlighted the role that social capital and different civic orientations played for the backwardness of the South. More specifically, Banfield, with his "amoral familism" hypothesis, believed that people living in the southern villages preferred self-interest (and the interest of the family) rather than public good. This attitude was "the moral basis of a backward society" (Banfield [1967]). Some decades later, Putnam, observing significant differences in civic participation levels between North and South, claimed that social capital territorial imbalances were conducive to divergence in economic performance. Specifically, social capital was a causal factor of social policy, institutional efficiency and economic growth. Further, he conjectured that differences in institutional efficiency and social capital values originate from the free city-states (*communes*) experience during the late *Middle Ages*- the self-government experience of some wealthy cities in central and northern Italy, opposed to the absolutist state experience of the southern part of the country in the same centuries. This institutional framework fostered political participation and civic engagement only in these central and northern cities, an effect that outlives the event that generated it and becomes persistent over time. Hence, high social capital levels can produce long-lasting effects, even inducing the adoption of institutions that transmit the same cultural attitude through time, in a path-dependent process.

This paper follows this line of research. I investigate the historical determinants of social capital levels in Italy providing a somewhat different but complementary explanation of the underlying factors that shape it in the first place, not necessarily in contradiction with Putnam's argument. Following more recent studies (Cappelli [2017], Felice [2013]), social capital levels

[1] Henceforth, post-Unification period and liberal age will be used with the same meaning.

seem to be more recent than Putnam suggested, and they might be the result of different formal and informal economic institutions operating in the eighteenth and the nineteenth century. For this reason, I focus the attention on the rural structure of the italian economy in the late nineteenth century, and on different agrarian regimes widespread throughout the Italian territory in that period (for instance, *latifundium* in the South and sharecropping activities in the Center-North). I advance the hypothesis that the prevalence of short-term tenancy agreements in agriculture, here represented by a huge mass of day workers (*braccianti*) and associated with the presence of large estates called *latifundia*, discouraged cooperation between landowners and peasants, then translating into lower levels of civic engagement and participation. By contrast, long-term contracts, possibly containing a risk-sharing component, by providing agents with iterated games, discouraged opportunism and created cooperation, an attitude ingrained in the cultural traits of the population and associated with higher civic capital measures. Such a cultural trait is then transmitted over generations, and it persists within the community, even after a change in the incentives structure has taken place.

Hence, I test the long-term effect of the diffusion of daily and seasonal laborers in agriculture in 1881 on various indicators of social capital in the present day. Following Guiso et al. [2016], I use the number of no-profit organizations and an indicator assuming value one if a city has an organ donation organization as measures of civic capital. In addition, I complement the analysis employing three new variables. As for the case of blood organ donations, an outcome-based measure, to qualify as a reliable index of social capital, should be directly linked to the input (civic capital) that produces it and be unaffected by other omitted factors. Two similar outputs are represented by the number of vehicles presenting a regular inspection and the number of vehicles with a regular insurance over the total number of registered vehicles in a given municipality. With respect to the number of no-profit institutions the two variables do not require a proactive behaviour by the citizenship, providing an immediate indicator of the internalization of the common good. For their peculiar nature, I will refer to them also as measures of compliance with rule of law. Finally, I use the logarithm of per capita social expenses at municipality level to approximate the sensitivity of a community to supply social facilities.

I find that short-term tenancy agreements in the past negatively affected civic capital measures in the present-day. Furthermore, the results seem to be robust both to different indicators employed in the empirical analysis and to different model specifications. These findings raise two considerations. On the one hand, changes in social capital might be the consequence of institutions more recent than the experience of self-government in the *Middle Ages*. On the other hand, this work has the merit to switch the attention given to pre-industrial economies from urban centers to the social life in the countryside in order to explain disparities in civic engagement.

My results are robust to to the presence of potential endogeneity. Certainly, concerns related to reverse causality cannot be raised, as the italian occupational structure dramatically changed throughout the last century. Yet, there might be some other geographical characteristics not controlled for that are correlated both with the share of daily farm workers in liberal age and with civic capital in the present-day. I investigate this contingency employing a newly assembled measure related to the presence of malaria in liberal age and using it as a source of exogenous variation in short-term contracts. Thus, I use this variable to instrument the fraction of daily and seasonal workers in the agricultural sector in order to mitigate the concern that we are capturing a somewhat spurious correlation.

Several scholars provide evidence on the vicious circle linking together malaria, peasants' settlement pattern, crop choice and short-term tenancy agreements (Celli [1933], Curtis [2013], Rossi-Doria [1958], Snowden [2008]). Specifically, malaria affects the settlement pattern of the agricultural workers, forcing them to settle on top of town hills. Hence, idle lands on the plains cannot be properly cultivated, and extensive monoculture on large estates becomes the best response to adopt. These *latifundia* rely on the work of labourers hired at seasonal or even daily basis[2].

I find that IV results confirm what found with OLS estimates. The coefficient of short-term agreements is negative and statistically significant in all specifications, and it is even strengthened in magnitude, presenting as twice as the size. Thus, the negative observed relationship between short-term contracts and civic capital is not randomly determined.

Moreover, I address the issue of spatial dependence, potentially deriving from different sources, such as emulative behaviours and spillover effects in a sort of diffusion process. I estimate three distinct specifications: a spatial error model, a spatial lag model and a more conservative general spatial model. Although spatial dependence emerges as a remarkable determinant of social capital, the share of daily farm workers retains its significance in all specifications (with some exceptions).

Once having determined such a robust correlation, I try to provide an explanation of the transmission of this cultural trait over time. Contrary to the hypothesis advanced by Guiso et al. [2016], based on what they call "self-efficacy", the belief a person holds with respect to his or her power to affect situations positively, I argue that a new institution carrying on a past cultural trait is needed in order to hand it down for generations and generations. Specifically, a new institution reproducing the same incentives structure that allows the subjective belief (civic capital) to put in place a cooperative action (social outcome) is necessary when

[2]Francesco Saverio Nitti, prime minister and prominent figure of Italian Parliament in liberal age, asserted: *"Malaria is the basis of all social life. It determines relations of production and the distribution of wealth. Malaria lies at the root of the most important demographic and economic facts. The distribution of property, the prevailing crop systems, and patterns of settlement are under the influence of this one powerful cause."*

the incentives structure of the past institution has long disappeared. I indicate the so-called "industrial districts", developed after the second world war in some areas of the center-north, as the main channel of transmission of the aptitude of cooperation from preindustrial Italy to the present-day.

A vast literature documented their relationship with sharecropping activities, incompatible with the adoption of short-term tenancy agreements (Ascoli and Paci [1983], Becattini [1989], Becattini et al. [2003], Fuà [1983], Zanotelli [2012] among others). A culture of mutual cooperation, sedimented in communities where sharecropping activities were mostly diffused, i.e. in the places now known as "third Italy", laid the foundations for the subsequent creation of the industrial districts. I use data from ISTAT reporting municipalities belonging to an industrial district in 2001 and I exploit their variation across Italy to test this hypothesis. When using the indicator as outcome variable, I find that short-term tenancy contracts negatively explain their future adoption. This result is robust to different estimators employed to assess their relationship. OLS, IV and spatial regressions are all consistent with a negative association between them. Further, I employ the same indicator as the main explanatory variable (either alone or along with the set of baseline controls) in order to evaluate their effect on measures of current civic capital, which is the missing link not yet explored. While I do not expect to find causation, the empirical exercise is valuable and highly informative *per sè*. Municipalities being part of an industrial district exhibit higher civic capital levels. The correlation seems to be robust to every specification and to all the variables used to proxy for social capital.

Finally, I divide the sample in two sub-samples in order to assess whether the observed relationship between short-term agreements and civic capital is mainly driven by certain macroregions. I estimate IV regressions considering only municipalities within the Center-North and those only within the South. The results show a negative relationship in the former case, while variation in the share of daily workers within the *Mezzogiorno* is not able to explain disparities in social capital. This goes in line with the proposed mechanism of transmission, as industrial districts were clearly predominant in the center-north. Without their creation, the culture of cooperation would not have transmitted through time as late as today.

Overall, my paper contributes to the literature in several ways. First, it provides a new explanation for imbalances in social capital levels in Italy, focusing on agrarian contractual agreements in liberal age. This is, to my knowledge, the first study that explores this mechanism in a within-country analysis, where formal political institutions are presumably identical across the territory. Second, I employ several measures of current civic capital distinguishing between indicators of prosocial behaviours and compliance with rule of law to test this hypothesis. Third, I argue that the adoption of short-term leases in the Italian countryside constitutes the best, or at least the inevitable, response to some non-removable constraints that large landowners were facing at that time. Malaria is found to be the most important among them. Specifically, it

influenced the settlement pattern of rural workers and the decisions to adopt short-term tenancy agreements in Italy as late as the land reform in 1950s, ultimately creating the conditions for current low civic capital. Finally, I propose and evaluate an original mechanism that may be responsible for the persistence of the effect through time: the role of the industrial districts.

The paper is structured as follows. In Section 2.2, I briefly present a literature overview of the topic; in Section 2.3, I outline an historical background of Italy's rural economy in the late nineteenth century and the first half of the twentieth century, and I examine the theoretical debate around the role of *latifundia* in the economic development of Italy; in Section 2.4, I briefly describe social capital and the distinction between pro-social behavior activities and measures of tax compliance. In Section 2.5, I describe the data used to conduct the empirical analysis, while in Section 2.6 I present the econometric strategy used to test the main hypotheses and I show the main results (OLS, IV and spatial estimates). In section 2.7 I describe the role of the industrial districts as a channel of transmission of civic engagement in the long run. Section 2.8 concludes the article, providing an interpretation of the main findings, as well as possible implications for future research.

2.2 Literature review

Extensive research has documented the role of institutions on long-term economic development. Acemoglu et al. [2001] claim that environment can influence economic performance by setting the conditions in which growth-enhancing institutions are shaped. Sokoloff and Engerman [2000] assert that higher inequalities in income and wealth, by concentrating *de facto* political power in the hands of few people, generate institutions that perpetuate these inequalities, resulting in a path-dependent process[3]. Within the framework proposed by Acemoglu et al. [2001], for instance, different agrarian regimes may be considered as formal institutions that can have a persistent impact on current social capital. According to this view, institutional differences are the result of historical heritage and natural endowments and can directly affect, through the consequent incentives structure, economic agents' behaviour and long-term economic growth.

This work is also linked to the literature on the impact of social capital and of trust on economic performance. Tabellini [2008, 2010] find a positive effect of culture and institutions on the level of economic development of the european regions. Knack [1999] finds a positive association between measures of trust and civic norms and the well-functioning of public institutions. Generally, trust and stronger civic norms broaden government accountability, facilitate agreement and foster innovation, all these factors resulting in a better government performance. Knack

[3]See also the works by Landes [1990], North [1991], North et al. [2009] to have a more comprehensive view of the role of institutions for long-term development. This literature is vast and is beyond the scope of this paper to survey it all.

and Keefer [1997] and Zak and Knack [2001], in a cross-country analysis, find that trust has an impact on economic performance and economic growth, while Helliwell and Putnam [1995] focused their analysis on the specific case-study of Italy, finding the same evidence. Uslaner [2002] finds a negative association between social capital and corruption, while Buonanno et al. [2009] document a negative effect of civic norms and associational networks with crime rates in italian provinces. Guiso et al. [2004] observe a positive relationship between social capital and many aspects of financial development, such as more checks use, lower investments in cash and higher investments in stocks, higher access to institutional credit and less use of informal credit. In another work, Guiso et al. [2009] find also a positive correlation between trust and trade levels. De Blasio and Nuzzo [2010], in an analysis at the provincial level in Italy, find a positive relationship between historical social capital and contemporary economic development.

Nonetheless, Glaeser et al. [2002], pag. 437, observe: *"while we have a theory and evidence on the effects of social capital, we are just beginning to identify the underlying mechanisms that create social capital in the first place"*. This paper contributes to address this gap by providing a previously unexamined explanation that links institutional and cultural attitudes in the past to contemporaneous social capital levels. The evidence presented here contributes to the literature referred to the historical determinants of social capital and trust. After the seminal works by Banfield [1967] and Putnam et al. [1994], only a few studies aimed at contributing to this literature have been carried out. Guiso et al. [2016], as I previously mentioned, tested Putnam's hypothesis, finding a positive impact of self-government experience in the *Middle Ages* on contemporaneous social capital measures. Beltrán Tapia [2012], Montolio and Tur-Prats [2018] highlight the legacy of the commons in Catalunya, arguing that the experience of cooperation among villagers, repeated over the centuries, increased social capital in each local community. In a global perspective, Nunn and Wantchekon [2011] show that current differences in trust levels within Africa can be traced back to the transatlantic and Indian Ocean slaves trade. Durante [2009] shows that norms of trust developed in pre-industrial times are a result of experiences of collective action and mutual insurance triggered by the need of farmers to cope with climatic risk. Litina [2016] advanced the hypothesis that low levels of land inequality in the past are associated with more intense cooperation and higher levels of contemporary social capital and development[4].

Further attempts to investigate the determinants of social capital in the specific case-study of Italy have been made in recent years. Pierce et al. [2016] find that historical social capital

[4]For a comprehensive literature overview on the relationship between culture and institutions, see Alesina and Giuliano [2015]. Among other things, they are aware that culture and institutions are endogenous variables determined by other exogenous factors such as technology, epidemics, geography, wars and other institutional shocks. Having this in mind, they assess the presence of a two-way causal effect between culture and institutions, by reviewing works based on a theoretical, empirical and historical approach.

is highly correlated with contemporaneous levels of trust and other social capital dimensions, confirming Putnam's hypothesis of path dependence in explaining the persisting differences in performance across italian regions[5]. Ferragina [2013] challenges Putnam's view that historical legacies brought about low civic capital levels in the South of Italy. On the contrary, he argues that historical heritage mitigated the negative effects of income inequalities, low labor market participation and weak national cohesion. Cappelli [2017] follows the same argument, challenging Putnam's view that social capital is persistent and mainly determined by historical legacy. With respect to previous works, he provides new provincial measures of social capital in the Post-Unification period in Italy, finding that social, institutional and economic features are more relevant than historical heritage in explaining civic capital differences. Among these factors, land inequality seems to have played the major role. Nonetheless, he does not address concerns on the plausible presence of endogeneity between the two phenomena, proving only that a correlation between them exists.

Several studies (for instance, Cinnirella and Hornung [2016], Tapia and Martinez-Galarraga [2018]) employed an IV approach to find a source of exogenous variation in landownership concentration. In a global perspective, this argument follows the line proposed by Easterly and Levine [2003], who showed how geographic endowments can ultimately affect economic development, paving the way for the creation of inclusive or extractive institutions[6]. Such instruments range from soil quality, the use of the Reconquest as a quasi-natural experiment, soil texture, to variability in temperature and rainfalls. In line with these works, although I am not precisely considering land inequality as endogenous variable, I focus on another so-called "non-removable constraint" (Galassi and Cohen [1994]) which may have determined the creation and maintenance through time of *latifundia*: malaria. Specifically, I argue that the adoption of short-term contracts in *latifundia* estates with a huge mass of daily and seasonal workers is highly associated with the presence of malaria. To the best of my knowledge, this is the first attempt to link the two phenomena in the italian context.

Finally, this work also complements the literature on the consequences of different tenancy contracts on human behavior and social norms. Provided that an opportunistic behavior stemming from a moral hazard incentive, if repeated through time, can translate into lower civic orientations, low tax compliance and lower propensity to cooperate, the adoption of short-term contracts can have persistent effects on social capital levels of a community. In a game theory framework, Scott [1987] explains how parties in continuing relationships can better sort out

[5]The authors employ Putnam's variables to proxy for social capial in the past. For the 1860-1920 period, they include: strength of mass-based parties, number of associations founded before 1860, incidence of cooperatives, membership in mutual aid societies, and electoral turnout. The variables are then examined using factor analysis and one single factor score is produced for each region.

[6]Remarkable examples consist of temperate opposed to tropical locations, ecological conditions shaping diseases, and environments suitable for the cultivation of grains or certain cash crops.

problems of information and enforcement and strengthen social and contractual norms. This cooperative equilibrium, therefore, by invoking legal and extralegal mechanisms, can be more easily reached in a long-term relationship between two parties. In an empirical perspective, Erridge and Greer [2002] analyze the obstacles and opportunities for the public sector to implement long-term supply relations and facilitate departmental coordination. While they find evidence of a positive association between partnership relations and social capital, they also show that these resources can have both positive and negative effects on public procurement. Ravindran et al. [2015] find a positive association between structural and positional embeddedness of participant firms and contract duration. Finally, from a broader historical perspective, in line with the present work, Carmona and Simpson [1999] highlight the role of the so-called *rabassa morta* to prompt social capital (trust) between landlords and farmers as late as the early twentieth century in Catalunyia[7]. Similarly, Simpson [2005] documents the efforts put in place by wine merchants in France between 1870 and 1911 to contrast the major shortages caused by the wine disease *phylloxera*. They exploited political power to achieve government intervention in order to control fraud and establish producer cooperatives.

2.3 Historical background

2.3.1 Three agrarian *Italie*

In the late nineteenth century, Italy was a prevalently rural economy. Most of the population was living in the widely scattered countryside and agriculture was the main economic sector. The high rise in population growth rate that characterized the two preceding centuries only interested rural areas and it was not accompanied by similar urbanization rates (Del Panta and Bacci [1980]). On average, 60% of the total labor force was engaged in agriculture and the percentage remained somewhat stable as late as 1951, when a second and more intense wave of industrialization took place, involving also southern regions (Felice [2018]). Three main different agrarian regimes characterized Italian agriculture in the Post-Unification period: a proto-capitalistic agriculture in the Po Valley, sharecropping activities in central and north-eastern regions, and *latifundia* in the South, along with some areas dominated by grapes, oil and fruit trees cultivations, especially along the coastal plains (Rossi Doria [2005]).

The agriculture in Po valley has been considered the only efficient farming for a long time, leading Bevilacqua et al. [1989] to coin the expression "emulative paradigm", when it comes to comparing alternative agrarian regimes. It was essentially an intensive agriculture based on high farming practices, coming from the manchesterian experience of English agriculture.

[7]The so-called *rabassa morta* presents features similar to sharecropping activities.

Although it was considered a modern and advanced proto-capitalistic farming, it was not sufficiently widespread throughout the Italian territory to trigger modern economic growth across the country. It was dominated by the so-called *"cascina irrigua"*, a little hamlet in the countryside, where wage workers and landowners used to live together, in proximity to barns, stalls, cattlesheds and the plots of land they were cultivating. The *Cascina* was meant to serve pasture and wheat-oriented big capitalistic farms, highly diffused in Po valley. On the contrary, on hills and mountains, export-oriented small and medium farms were widespread, most often managed using sharecropping agreements. One of the main *cascine*'s characteristics relies on the proximity of nuclear family to the workplace. This contingency enhanced solidarity among members of the same production unit, that after Unification led to the creation of associational organizations such as unions, cooperatives and mutual aid societies, mostly aimed to promote the interests of the internal members. Then, interpersonal trust translated into the creation of social networks and associations that promoted trust outside nuclear family. As a consequence, workers' bargaining power was relatively higher and land inequality levels lower than in other geographic areas of the peninsula.

Sharecropping was predominant in the regions of the so-called "third Italy"(Fuà [1983], Becattini [1989]). The presence of sharecropping activities in Tuscany during the fifteenth century is documented by Ackerberg and Botticini [2002], who make use of data coming from the *Florentine Cadastro* of 1427. My data show that in late nineteenth century they were prevalently widespread across all central and north-eastern regions, such as Tuscany, Umbria, Marches and the coastal part of Emilia and Veneto[8]. Sharecroppers were settled in isolated farmhouses (the so-called *poderi*) with their extended family. Tree crops such as olive and grapevine trees together with husbandry for self-consumption characterized this kind of agriculture. Living close to the workplace allowed peasants to dealing with water canalization, making terracing, monitoring livestock. In addition, each member of the family had to contribute with non-remunerated work to productive activity. These elements favored solidarity among the members of the family. Furthermore, family income was often integrated with manufacturing activities, based on handmade job carried out inside farmhouses. They were commissioned by small merchants and entrepreneurs who provided raw materials and work tools. Hence, new work relationships were established which, together with interpersonal relations within neighboring families, prompted cooperation and social trust even outside the family.

By contrast, South's rural economy was dominated by *latifundia*, as these large estates were called, based on extensive agriculture and on the presence of daily and seasonal workers. They were diffused above all across internal areas, while tree crops were widespread along the plains of some coastal provinces. Where large estates were prevalent, workers dwelled in small villages on

[8]The map of sharecropping extension is available upon request. It can be easily noticed the negative association with the percentage of daily workers over the agricultural labor force (*braccianti*).

the top of hills, far away from wheat cultivations. Some scholars (Sallares et al. [2002], Snowden [2008]) claim this was due to malaria disease, widespread along the coastal plains. Some others (i.e. Rossi-Doria [1948]) assert the main cause was the extreme farms' fractionalization, inducing peasants to settle in villages placed at an average distance from the several plots of land scattered across the territory. Where workplace and dwelling did not coincide, nuclear family, opposed to the extended family, is found to be the fundamental organizational unit of society at large. Thus, in such a context, interpersonal trust struggled to thrive[9].

2.3.2 The debate around *latifundia*

Latifundia have often been at the center of political debate upon South backwardness during the late nineteenth century and the first half of twentieth century. Many projects aimed at improving the conditions of Southern economy were proposed, ranging from land redistribution and land reclamation to the construction of public infrastructures such as state-build roads and irrigation systems. Nonetheless, none of them was successfully and significantly implemented. The Prime Minister Giovanni Giolitti ordered in 1909 a parliamentary inquiry upon the living standards of southern peasantry (Faina [1909]). Apart from a considerable increase in migration rates, no changes were registered in the rural structure of the southern economy twenty years after the implementation of the previous inquiry (Jacini [1976]). Workers' main concern was to overcome seasonal and chronic underemployment, due to land-intensive agriculture, in contrast with factor endowments of the South, rich of labor and poor of land. After the WWI, social distress dramatically increased and peasants rose up against large landowners and public institutions. During the so-called *biennio rosso*, the revolutionary upsurge of 1919-1921, turmoil with several strikes and a widespread occupation of idle lands in many southern *latifundia* arose. The main aim of peasants' revolt was to obtain from landowners a minimum level of yearly employment (the so-called *imponibile di manodopera*). The insurrection ended with the violent rise of Fascism in October 1922, with an imposition of a twenty-year dictatorship. Afterwards, attempts of land redistribution, land reclamation and improvements of southern peasantry did not produce any result until the land reform was eventually implemented after World War II.

Traditional historiography considered *latifundia* negatively, attributing them a central role in the Post-Unification growth. This traditional view was stated by the seminal work of the Marxist scholar Sereni (Sereni [1971]), who attributed South backwardness to the landowners'

[9] Banfield [1967] put emphasis on low "generalized trust" (see also Tabellini [2010]) referred to population of the small village of Montegrano, in Basilicata. He argues that social norms only safeguard agreements among members within the nuclear family, while they are not enforced outside the family. This attitude goes under the name of "amoral familism". According to his argument, such a different family model might explain lower propensity in the South to solve collective action dilemmas in order to provide public goods.

absenteeism. Large landowners were declared to be the main responsible of the chronic under-employment of labor force in the countryside and low agricultural productivity. Furthermore, traditional literature highlighted their inability to introduce new crop mixes and rotation techniques, as had been done in northwestern european countries. Short-term contracts were at the root of low productive investments for land improvements and "feudal" heritage in contractual agreements characterized agent's behavior.

In recent years, a more recent branch of revisionist literature challenged Sereni's traditionalist view. Some of non-Marxist scholars have tried to reconcile landowners behaviour with the rationality hypothesis. According to some case studies (Petrusewicz [1989], Placanica [1990], Galassi [2001]) landowners were profit-maximizing, but they faced different "non-removable constraints" and choice sets than did landowners in the North of Italy. They could be summarized by essentially different environmental and climatic conditions such as high variability in yearly temperatures, lack of rain in summer and different soil texture and ruggedness (Bevilacqua et al. [1989], Lupo [1990]). Many contractual agreements, widely seen negatively, have been reconsidered and seen as a rational response to risk-bearing issues. Supervision-intensive cash crops, frictions in credit and insurance markets, as well as high income variance due to crop yield variability determined the underlying incentives structure, at the root of different tenancy contracts widespread throughout Italian territory (Cohen and Galassi [1990], Galassi and Cohen [1994])[10]. Furthermore, high land concentration endowed large landowners with *de facto* political power, affecting the number of citizens that could participate in the political debate about matters related to their community[11]. Hence, they could have easily exploited their political position to push public policies in favour of their needs. Indeed, under the assumption that land inequality is associated with the control of local public councils by large landowners (local notables), the adoption of public policies aimed to promote pro-growth public goods might be hampered by the presence of vested interests, presumably opposed to the interests of the mass of rural population[12].

In the empirical analysis I employ a measure aimed to approximate the adoption of short-term contracts regulating bargaining power between peasants and landowners: the share of daily and seasonal workers (*braccianti*) over the total labor force in agriculture.

[10] See Cohen and Federico [2001] for a broad history of Italian agriculture and for recent developments of this new brand of revisionist literature.

[11] Italy underwent several suffrage regimes during that period, reaching the universal male suffrage only in 1919. Previously, the right to vote was assigned based on education and income levels.

[12] Indeed, for instance, municipalities had empowered to manage public resources in order to implement public schooling laws as late as 1911. After that, with the *Daneo-Credaro* law, in 1911, the power to manage public expense in education was transferred from municipalities to the central government.

2.4 Definition and measurement of social capital

There has been a great amount of economic research on social capital in the past decades, yet its definition remains vague and elusive. Social capital is defined by the OECD as "networks together with shared norms, values and understandings that facilitate co-operation within or among groups" (Brian [2007]). Nevertheless, most of the time, economists mainly refer to social capital only as trust. Glaeser et al. [2002] point out that "economists understand the role that repeated interaction plays in solving free-rider problems and reducing opportunism", an insight confirmed by theoretical literature on repeated games, that explains how a collaborative behavior is more likely to be held when individuals expect to interact more often in the future. Kenneth Arrow underlined the importance of social trust as early as 1972 (Arrow [1972]), when he wrote that *"virtually every commercial transaction has within itself an element of trust, certainly any transaction conducted over a period of time. It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence"*. Hence, in contexts where the level of social trust is high, economic and institutional development are enhanced because it facilitates cooperation and the solution of collective action dilemmas among members of the same community. Nonetheless, not every social capital dimension is conducive to improvements in economic activity. Differences between bonding, bridging and linking social capital measures have been identified in literature (Sabatini [2009]).

Bonding civic capital measures present a negative connotation and they are generally referred to as small circles of people, only interested to privilege the vested interests of the participants within the group boundaries. Further, bridging social capital refers to the ability of different heterogeneous groups to collaborate among each other. It is then associated with higher diffusion of information, commercial transactions and economic activity. Finally, linking social capital is a term related to ties connecting individuals and their civil society organizations with public institutions. It is then a useful tool to overcome collective action dilemma, above all when the aim is to perform activities based on internal cooperation and when these advocacy activities are aimed at providing public goods for the members involved within the community at stake[13]. It is straightforward to note that the last two dimensions of social capital are correlated with good economic performance and high levels of development, whereas the former might be detrimental for the economic activity of a community at large[14]. For the purpose of this work, I will only focus on the "good" social capital dimensions, namely the ones I believe are proxying bridging and linking social capital.

[13]For instance, cooperation is essential in preindustrial societies to provide agricultural infrastructures, such as storage facilities, drainage systems and irrigation systems (see Litina [2016]).

[14]One example is the work by Satyanath et al. [2017], who document that a dense network of voluntary associations facilitated the rise of the Nazi Party by bringing more people into contact with the party's message and helping to destroy the democratic system.

Moreover, I focus my attention on measures of compliance with the rule of law (or tax compliance), that I believe that can be plausibly seen as an indicator of civic mindedness of a community. Indeed, although European countries generally share the same formal rules and public institutions, tax compliance rates vary substantially across them (Zhang et al. [2016], Alm et al. [2004], Schneider and Enste [2013]). The literature has put forth several explanations for those imbalances, all based on "institutionalist" theories (Torgler and Schneider [2007], Cummings et al. [2009]). Such theories argue that citizens are willing to pay taxes if they believe that the government will spend public money in an effective way. Hence, they focus on the relationship between the quality of government and the willingness of the citizens to abide by the rules and pay taxes. A second brunch of literature focuses on the relationship between compliance with rule of law and cultural values and beliefs. Southern European countries are considered more "familistic", or opportunistic, meaning that virtuous conduct is believed to apply only within members of the same family or group, while an opportunistic behavior is normally applied towards people outside the family (Banfield [1967], Platteau [2015]). By contrast, northwestern countries are characterized by values of individualism and autonomy, and people are more prone to apply the same rules of conduct to all members of the community at large[15]. The latter explanation justifies different tax compliance rates across countries, although sharing the same institutional features. Hence, this implies that, in most of the cases, enhancing the levels of monitoring and enforceability should not prevent people from cheating, as such public policy measures may well not be an effective deterrent. This is particularly important, as the ability of governments to properly collect revenues is crucial for successfully meet their policy goals[16].

Then, social capital measures can be decomposed in two different subgroups: *i)* civic capital measures identifying a prosocial behavior in civil society; *ii)* measures identifying compliance with rule of law (or tax compliance). In the first cathgory I include the number of no-profit institutions, the dummy for cities presenting an organ donation organization and per capita social expenses. In the second, I insert the percentage of automobiles with a regular inspection and the percentage of automobiles exhibiting a regular insurance (see section 2.5 for their description). Then, I test the hypothesis that these current social capital measures are influenced by short-term contracts in the past, defining relations between landowners and peasants in Post-Unification Italy.

[15] Tabellini [2010] defined this distinction as "generalized" vs "limited" morality.

[16] See Haggard and Tiede [2011], who explore the mechanisms through which the rule of law can affect economic growth, reviewing the theory underlying the different channels of transmission of the effect.

2.5 Data and empirical strategy

In this section, I describe the data employed in the empirical part. A synthetic description of the variables along with their sources and definitions is contained in the appendix, table 2.13, while in tables 2.1 and 2.2 I display the main descriptive statistics of the variables employed in the following section in order to to test my hypothesis. Overall, my sample contains 7951 observations, corresponding to municipalities in 2001. Nonetheless, my historical variables are collected at district-level (the 205 *circondarii* in liberal age).

2.5.1 Social capital measures

In order to estimate the effect of the presence of short-term contracts in agriculture on social capital measures, I collected data at different levels of disaggregation. Social capital indicators are referred to the present-day (2001) and are collected at municipality-level.

Following Putnam et al. [1994], I use the presence of nonprofit organizations as the main variable of social capital. Specifically, I use the total number of nonprofit institutions over the total population in 2000 for each municipality, a measure already employed by Guiso et al. [2016]. Moreover, to have a more comprehensive picture of social capital disparities across the Italian territory, I also employed other variables that can potentially be expressed as social capital measures. Hence, I complement my empirical strategy with additional indicators.

As Guiso et al. [2016] pointed out, for an outcome-based social capital measure to represent a reliable indicator of its presence within a community, the relationship between the input (the subjective belief and/or value) and the registered output should not be influenced by other omitted factors, such as legal enforcement. This is particularly true when it comes to using indicators proxying compliance with rule of law. Although these conditions are hard to be met, some exceptions do exist. Following Guiso et al. [2016], I use the same indicator for the existence of an organ donation organization in a municipality. This measure represents a clear example of individuals' internalization of the common good. Indeed, donating organs has no direct compensation and there is neither any economic payoff nor any legal obligation to donate. For a similar reason, I also collected data referred to social expenditures in 2015 (in logarithm). Once rescaled for the population, it approximates the sensitivity of a community to supply social facilities, as well as its institutional efficiency. In Italy, indeed, the decision of the amount to be donated in public social expenses is devoted to municipal councils. Further, to my knowledge, it has never been used to measure civic capital levels in a within-country analysis.

Finally, I gathered information referred to the number of vehicles presenting a regular inspection and a regular insurance. As said, I will refer to them as the two measures proxying compliance with rule of law. Although they do not represent a voluntary behavior to be civic

within a community, legal enforcement is weak *de facto*. Surprisingly, indeed, both display remarkable heterogeneity across the italian territory. In some municipalities I observe that, on average, respectively 48% and 50% of registered vehicles do not present a regular insurance and a regular inspection, while in other municipalities the percentage reaches the levels of 97% and 98% (1st and 99th percentiles of the two distributions, see table 2.1). Then, compliance with rule of law varies substantially across italian regions, in spite of sharing the same institutional features.

Table 2.1: Social capital measures

Social capital	Mean	Median	Std.Dev.	1st percentile	99th percentile
N. of no profit organizations (per 1000 inhabitants)	5.484	4.261	12.087	0	24.793
City has an organ donation organization	0.0416	0	0.200	0	1
Automobiles with a regular inspection (%	0.827	0.860	0.122	0.504	0.980
Automobiles with a regular insurance (%)	0.809	0.839	0.121	0.491	0.968
Log of social expenditures (per capita)	4.151	4.219	0.914	1.099	6.180
Obs.	7847				

Notes: Descriptive statistics for variables disaggregated at municipality-level.

2.5.2 Other historical and geographical variables

With the aim to provide a picture of the agrarian structure of the italian economy in the Post-Unification period, I collected data at district-level (the so-called *circondarii*) on tenancy contracts in 1881, the first year in which I observe this variable. One adequate measure of the diffusion of short-term contracts in agriculture is represented by the fraction of daily and seasonal farm laborers (*braccianti*) over the total labor force engaged in agriculture (Tapia and Martinez-Galarraga [2018]). Such a measure is slightly different from the one employed by Tapia and Martinez-Galarraga [2018], as it only includes farm labourers employed at daily or seasonal basis. By contrast, the authors account for all farm labourers, without distinguishing between short-term *vs* long-term contracts. The reason must be traced in their need to reconstruct a proxy for landownership concentration rather than a measure for the presence of short-term contracts in agriculture, given the unobservability of Gini index. The geographical pattern of such a variable is displayed in figure 2.1, left-side[17]. The highest level of farm labourers hired at a provisional basis is registered in the southern part of the peninsula and in some provinces of the Po Valley, especially in *Romagna*, as well as along the Tyrrhenian coast from Tuscany

[17] Although the map shows a level of municipal disaggregation, data are at district-level. Unfortunately, shapefiles for the ancient italian *circondarii* are not available.

until the Pontine marshes. This picture basically reflects the contours of the *latifundia* regions described by the literature, with some discrepancy (see Bevilacqua et al. [1989], Felice [2013]).

Data on municipality elevation, maximum difference in elevation, population, per capita income, income and land inequality in 2001, and coastal location (dummy for cities being within a radius of 5 km from the coast, and a dummy for a city being by the sea) come from Guiso et al. [2016], and I will follow suit by including all these geographic controls in my regression framework.

In order to test the proposed mechanism of transmission, I gathered information on the presence of industrial districts. The dummy variable, taking on value one whether the city belongs to an industrial district and zero otherwise, comes from the Census of Industry and Services of 2001, carried out by ISTAT on the basis of Local Labour Systems (*Sistemi Locali del Lavoro, SLL*).

Finally, information on the share of the surface covered by malaria come from the digitalization of Torelli map *"Carta della malaria dell'Italia"*, drawn by Luigi Torelli in 1882. Data have been collected at grid cell level, then used to construct municipal estimates, and ultimately reaggregated at district-level at borders in 1881. This variable represents the instrument employed in section 2.6.2 as a source of exogenous variation in short-term tenancy agreements. Figure 2.1, right-side, shows its geographic pattern. All the southern part of Italy displays an extensive diffusion of malaria, above all along the coastal plains, as well as in some areas of the Po valley. It can be noticed how the presence of daily farm labourers, in most of the cases, shares with malaria disease the same territorial extension.

Table 2.2: Historical and geographical variables

Control and instrumental variables	Mean	Median	Std.Dev.	1st percentile	99th percentile
Day workers share 1881	30.192	30.001	14.080	7.494	64.310
Max difference in elevation	0.616	0.435	0.621	0.004	2.546
Municipality is on the coast	0.083	0	0.276	0	1
Municipality located near the sea (5 km)	0.035	0	0.184	0	1
Population	0.007	0.002	0.040	0.0001	0.069
Gini land inequality index 2001	0.599	0.600	0.170	0.154	0.940
Gini income index 2001	0.375	0.373	0.038	0.288	0.4859459
Income per capita 2001	11.920	12.058	2.867	6.637	18.56
Industrial districts	0.286	0	0.452	0	1
Malaria share (over total surface)	28.953	18.027	28.540	0	99.063
Obs.	7623				

Notes: Descriptive statistics for variables disaggregated at municipality-level. Day workers share 1881 and malaria share (over total surface) are disaggregated at district-level.

2.6 Empirical results

2.6.1 OLS results, weighted

In order to test whether short-term contracts are negatively associated with civic capital, I estimate the following model:

$$SocCap_i = \alpha + \beta short - term_j + \gamma X_i + \eta_m + \epsilon_i, j < i \tag{2.1}$$

where i indexes municipalities, j indexes districts (*circondarii* in 1881), and η_m represents macroregional dummies. $short - term_j$ denotes the variable of interest, here proxied by the percentage of daily workers over the total labor force engaged in agriculture, while X_i is a set of covariates that allows controlling for other factors that may hinder the identification strategy. $SocCap_i$ denotes the civic capital measures alternatively employed in the empirical analysis as outcome variables.

Table 2.3 reports regression results for estimating equation 2.1. The first measure of civic capital used in the empirical analysis is the number of nonprofit institutions over the 2001 population for each municipality. I regress this measure on the percentage of daily farm laborers in liberal age and on a set of covariates. While column (1) presents results with baseline controls, columns (2)–(6) sequentially add the set of covariates described in section 2.5.2 and complicate model specification. To be consistent with Guiso et al. [2016], I insert a number of geographic controls to account for heterogeneity among different municipalities, which may confound the results. I include the average elevation to control for mountain location and the maximum difference in elevation within the same municipality to control for geographically driven differences in interaction costs. Then, I control for the presence of cities located by the sea or within 5 km from the sea. Finally, as a measure of size, I insert both the level of population (in millions of inhabitants) and its square, because I do not know how it affects civic capital. Finally, since measures of civic capital are noisier for smaller municipalities, I use the weighted least-squared method, weighted by the population in 2001.

I find a large and statistically significant impact of the short-term tenancy contracts in liberal age on the number of nonprofit institutions divided by the population in 2001 (coefficients and standard errors in bold). In column I, a one standard deviation increase in the percentage of daily farm labourers results in a 0.046 standard deviation decrease in the number of no-profit institutions per 1000 inhabitants. In column II, I add a measure of income inequality and a measure of land inequality in the present-day, as suggested by Alesina and La Ferrara [2002]. Although these variables allow me to account for heterogeneity in inequality within a community, this can make my estimates worse, since inequality might be the result rather than a determinat of persistent low civic capital values. Nonetheless, the impact of both variables remains negative

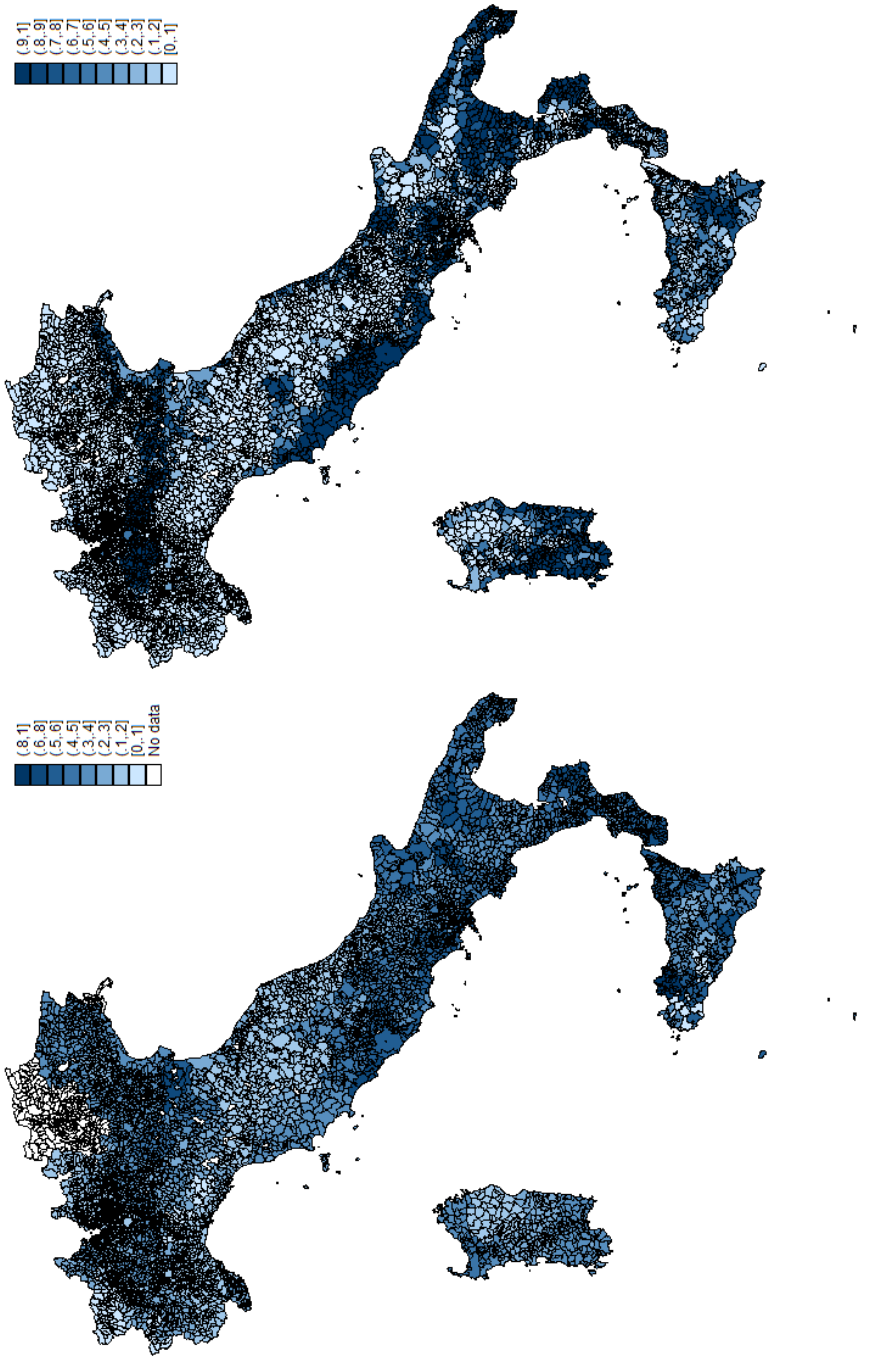

Figure 2.1: Short-term contracts [left-side] and malaria [right-side]. My own elaborations on 1881 Population Census and digitalization of Torelli's map. Darker areas correspond to higher values.

Table 2.3: No profit institutions

No Profit institutions	Whole sample	Whole sample	No large towns	No provincial capitals	Whole sample	Whole sample
Day workers share (1881)	**-0.0394*** **	**-0.0387*** **	**-0.0433*** **	**-0.0382*** **	**0.0015**	**-0.0240*** **
	0.0045	**0.0042**	**0.0033**	**0.0028**	**0.0035**	**0.0045**
Elevation	0.4644	0.5429	0.5976*	0.3489	1.6551***	1.9948***
	0.3813	0.3778	0.3462	0.3622	0.3316	0.3980
Max difference in elevation	0.7830***	0.6828***	0.7869***	0.7625***	0.6324***	0.6904***
	0.1666	0.1630	0.1583	0.1542	0.1432	0.1521
City is on the coast	-0.1257	-0.2167	-0.2234*	0.1046	0.4739***	0.4279**
	0.1901	0.1833	0.1356	0.1102	0.1313	0.1680
City more than 5 km from the coast	-0.2876	-0.2328	0.0421	0.2186	0.5066**	0.1985
	0.2586	0.2531	0.2534	0.2430	0.2415	0.2539
Population	0.2137	-0.7922	-46.9823***	-52.7371***	-2.6650***	-0.3639
	0.5593	0.5153	7.1893	7.3500	0.3629	0.4529
Population (squared)	-0.0131	0.2817	577.3980***	351.6418***	0.6904***	0.0041
	0.2230	0.1927	76.2917	100.8332	0.1276	0.1745
Gini land inequality index 2001		1.4189***	1.0252***	0.7937***	0.8554**	0.8760**
		0.4361	0.3239	0.2564	0.3474	0.4138
Gini income inequality index 2001		7.3961***	6.9876***	4.9451***	-2.7544*	7.8229***
		1.8913	1.4171	1.2057	1.6391	1.7655
Income per capita					0.3981***	
					0.0203	
Latitude						-0.0000
						0.0000
Area dummies	NO	NO	NO	NO	NO	YES
Constant	YES	YES	YES	YES	YES	YES
N	7623	7623	7591	7524	7623	7623
adj. R-sq	0.047	0.052	0.067	0.059	0.112	0.083
F	23.45	21.68	50.56	58.20	73.75	41.46

Notes: WLS estimates, weighted for population. Robust standard errors are reported in parentheses. ***Significant at 1%; **significant at 5%; *significant at 10%.

and significant. Despite controlling for population size and its squared, still the estimates may be distorted by the presence of more densely populated municipalities within the sample. Hence, in column III, I exclude the largest towns (with more than 120,000 inhabitants). The effect of daily farm workers remains unchanged. Moreover, municipalities with a prominent administrative role could present higher civic capital measures and a lower daily laborers share due to the greater participation of the active labor force in the industry and the services sectors, possibly affecting my estimates. For this reason, I exclude the provincial capitals from my sample and I run a new regression ruling them out in column IV. Again, the effect of daily farm laborers remains invariate. Then, I follow Glaeser et al. [2002] and I include the level of per capita income in column V. Indeed, individual investment decisions in social capital can depend on income levels. Because districts with a higher level of daily and seasonal peasants (*braccianti*) were less likely to be richer, the indicator might barely proxy for unobserved characteristics hampering prosperity. Thus, I should include income levels in liberal age to account for prosperity at that time. Unfortunately, I do not observe GDP and/or GDP per capita in the Post-Unification period both at province- or district-level, nor do I have at hand a convincing proxy at municipality-level. Therefore, I rely on contemporaneous income per capita values. This highly conservative model specification might bias our estimates, since the relationship between social capital and income per capita is certainly endogenous. As Knack and Keefer [1997] demonstrate, indeed, civic capital itself fosters growth, thus covering or underestimating the impact of the share of daily farm laborers. Hence, once I factor in income per capita, as expected, the effect of farm laborers vanishes, presenting an even positive impact on social capital values. For this reason, I exclude it in the last specification, in column VI, once departmental dummies (northwest, northeast, center and south and islands) and latitude are accounted for, in order to capture unobserved geographical heterogeneity across macroregions. These dummies are all significant (for the sake of brevity, the coefficients are not reported). Despite their inclusion, the coefficient of the short-term tenancy contracts remains negative and retains its significance (despite of a loss in magnitude).

In table 2.4, I repeat the estimation using the second measure of social capital, the dummy for the presence of an organ donation organization[18]. Here the results are reverted. Apart from the conservative specification with the inclusion of income per capita within the set of controls (column II), the share of daily farm workers is not negatively associated with cities presenting an organ donation organization in a significant way. At a first glance, the contribute of short-term tenancy agreements to civic capital deterioration does not seem to be robust to changes in social capital measurement.

In Tables 2.5 and 2.6, I employ two measures of compliance with rule of law (tax compliance).

[18]For the sake of exposition, I only report the specification in column I, V, and VI.

Table 2.4: AIDO venue

AIDO venue	Whole sample (I)	Whole sample (II)	Whole sample (III)
Day workers share 1881	-0.0013	0.0033***	-0.0010
	0.0009	0.0010	0.0011
Elevation	-0.3260***	-0.1982***	-0.2089***
	0.0746	0.0672	0.0740
Max difference in elevation	0.0422	0.0365	0.0450
	0.0302	0.0267	0.0292
City is on the coast	0.0175	0.0968**	0.0598
	0.0458	0.0434	0.0462
City more than 5 km from the coast	-0.0592	0.0257	-0.0385
	0.0467	0.0458	0.0459
Population	1.0567***	0.8415***	1.1173***
	0.1971	0.1760	0.1895
Population squared	-0.3493***	-0.3024***	-0.3757***
	0.0723	0.0629	0.0693
Gini land inequality index 2001	0.3744***	0.3097***	0.3120***
	0.0891	0.0832	0.0940
Gini income inequality index 2001	3.0142***	1.8479***	3.1097***
	0.4510	0.4479	0.4415
Income per capita		0.0457***	
		0.0050	
Latitude			0.0000
			0.0000
Area dummies	NO	NO	YES
Constant	YES	YES	YES
N	7623	7623	7623
adj. R-sq	0.440	0.483	0.453
F	48.27	65.83	42.86

Notes: WLS estimates, weighted for population. Robust standard errors are reported in parentheses. ***Significant at 1%; **significant at 5%; *significant at 10%.

Table 2.5: Cars' inspection

Cars inspection	Whole sample (I)	Whole sample (II)	Whole sample (III)
Day workers share 1881	-0.0035***	-0.0018***	-0.0017***
	0.0005	0.0005	0.0004
Elevatione	-0.0596***	-0.0146	-0.0086
	0.0185	0.0161	0.0189
Max difference in elevation	-0.0235***	-0.0256***	-0.0228***
	0.0077	0.0076	0.0082
City is on the coast	-0.0628***	-0.0349***	-0.0179
	0.0120	0.0104	0.0120
City more than 5 km from the coast	-0.0385***	-0.0086	-0.0045
	0.0132	0.0128	0.0123
Population	-0.0481	-0.1243*	-0.0982*
	0.0799	0.0690	0.0594
Population squared	-0.0131	0.0035	0.0022
	0.0310	0.0265	0.0234
Gini land inequality index 2001	0.1323***	0.1090***	0.1819***
	0.0448	0.0365	0.0351
Gini income inequality index 2001	0.2073*	-0.2084*	0.1516
	0.1230	0.1124	0.1095
Income per capita		0.0162***	
		0.0021	
Latitude			-0.0000
			0.0000
Area dummies	NO	NO	YES
Constant	YES	YES	YES
N	7583	7583	7583
adj. R-sq	0.436	0.505	0.540
F	473.7	921.3	.

Notes: WLS estimates. Robust standard errors are reported in parentheses. ***Significant at 1%; **significant at 5%; *significant at 10%.

Table 2.6: Cars' insurance

Cars insurance	Whole sample (I)	Whole sample (II)	Whole sample (III)
Day workers share 1881	-0.0031***	-0.0015***	-0.0015***
	0.0005	0.0006	0.0005
Elevation	-0.0751***	-0.0322*	-0.0289
	0.0187	0.0165	0.0196
Max difference in elevation	-0.0150*	-0.0170**	-0.0146*
	0.0079	0.0078	0.0083
City is on the coast	-0.0556***	-0.0290***	-0.0160
	0.0112	0.0106	0.0123
City more than 5 km from the coast	-0.0373***	-0.0088	-0.0070
	0.0131	0.0126	0.0121
Population	-0.0991	-0.1717**	-0.1412**
	0.0782	0.0689	0.0694
Population squared	0.0092	0.0250	0.0213
	0.0308	0.0271	0.0274
Gini land inequality index 2001	0.0992**	0.0770**	0.1400***
	0.0415	0.0341	0.0387
Gini income inequality index 2001	0.2536**	-0.1425	0.2044*
	0.1181	0.1215	0.1154
Income per capita		0.0155***	
		0.0019	
Latitude			-0.0000
			0.0000
Area dummies	NO	NO	YES
Constant	YES	YES	YES
N	7583	7583	7583
adj. R-sq	0.390	0.460	0.481
F	518.9	442.6	.

Notes: WLS estimates. Robust standard errors are reported in parentheses. ***Significant at 1%; **significant at 5%; *significant at 10%.

Specifically, table 2.5 shows regressions using as dependent variable the ratio of automobiles presenting a regular inspection in 2016 over the total number of registered automobiles within the same municipality, whereas in table 2.6 I refer to the number of automobiles with a regular insurance. As previously mentioned, an outcome-based measure to qualify as a reliable index of social capital should be directly related to the subjective belief livening it up. I believe this is the case for two prevailing reasons. First, although these outcome-based social capital measures may be biased by differences in legal enforcement across municipalities, it can be assumed that the obligations of having a regular inspection and a regular insurance are weakly enforced throughout all the Italian territory in the same way. Second, and most importantly, the propensity to insure and inspect an automobile represents a more immediate indicator of the internalization of the common good, not requiring a proactive behaviour by the citizen, as does occur in the event of setting up a new association. Both tables show that short-term contracts are negatively and significantly correlated with the fraction of cars' inspections and with the fraction of cars' insurances. Moreover, the results appear to be robust not only to different outcome measures, but also to different model specifications.

In table 2.7, I report results employing the level of social expenditures per capita (in log) for each municipality in 2015 as the main outcome variable. Again, the short-term contracts in agriculture seem to produce a negative and statistically significant effect in all the three specifications. The magnitude of the effect tends to decrease once the level of GDP per capita is included within the control variables, meaning that omitted factors are hiding the true relationship between these two measures. Taking as a reference the specification outlined in column III (with macroregional dummies), a one standard deviation increase in the percentage of daily farm workers over the total agrarian labor force induces a 0.157 standard deviation decrease in the logarithm of social expenses per capita.

With exception to the fuzzy results using the dummy for cities with an organ donation organization as outcome, all regressions point to the same direction. Whether I use civil capital measures replicating a prosocial behavior in the society (non-profit institutions, social expenses) or rule of law compliance indicators (fraction of vehicles with regular insurance and regular inspection), the results seem to be highly robust[19]. In addition, the results seem to be robust to different model specifications employed in the empirical analysis. Similar findings confirm the fact that the presence of different tenancy contracts (short-term vs long-term contracts) within an agrarian community played a prominent role in shaping civic capital orientations. Ultimately, they provide a somewhat alternative but complementary explanation of social capital imbalances

[19]To be precise, public social expenses might fit into both groups, and the suggested classification is totally arbitrary. This means that the border between the two groups is evanescent and it is better to evaluate the impact of each variable on a case-by-case basis.

Table 2.7: Social expenditures

Log of social expenses (p.c.)	Whole sample (I)	Whole sample (II)	Whole sample (III)
Day workers share 1881	-0.0171***	-0.0058***	-0.0102***
	0.0013	0.0012	0.0013
Elevation	-0.7683***	-0.4574***	-0.3223***
	0.0889	0.0761	0.0855
Max difference in elevation	-0.0993***	-0.1129***	-0.0973***
	0.0370	0.0342	0.0320
City is on the coast	-0.2282***	-0.0342	0.0016
	0.0646	0.0487	0.0550
City more than 5 km from the coast	-0.2111***	-0.0024	-0.0444
	0.0587	0.0557	0.0609
Population	0.6695**	0.1477	0.7223***
	0.2916	0.1971	0.2254
Population squared	-0.1264	-0.0128	-0.1899**
	0.1090	0.0713	0.0837
Gini land inequality 2001	0.9666***	0.8067***	0.8733***
	0.1584	0.1064	0.1453
Gini income inequality index 2001	2.9151***	0.0675	2.8964***
	0.5658	0.4541	0.4728
Income per capita		0.1114***	
		0.0063	
Latitude			-0.0000
			0.0000
Area dummies	NO	NO	YES
Constant	YES	YES	YES
N	7464	7464	7464
adj. R-sq	0.348	0.452	0.427
F	82.46	175.5	100.2

Notes: WLS estimates. Robust standard errors are reported in parentheses. ***Significant at 1%; **significant at 5%; *significant at 10%.

in Italy with respect to the experience of Free-city states in the *Middle Ages*, the hypothesis put forth by Putnam (Putnam et al. [1994]) and then tested by Guiso et al. [2016].

First, my results seem to be in contrast with Putnam's view that disparities in civic capital values originate from the free-communal experience of the *Middle Ages*. Indeed, in line with "the compression of history hypothesis" (Austin [2008]), my estimates confirm the role of agrarian regimes widespread after Unification, and thus still operating after almost four hundred years since the self-government experience of some wealthy central and northern cities. Hence, from a time dimensional viewpoint, changes in social capital values might be the consequence of more recent institutional changes.

Second, my attention is prevalently devoted to the rural structure of the italian economy, thus neglecting the role of social life in urban centers and their driving force in encouraging cooperative behaviour among citizens. Of course, this choice presents some limitations, primarily due to the assumption that from this empirical exercise we can infer indications extendable to the whole population (a *pars pro toto*). Nonetheless, conferring more weight to life in the countryside can be legitimated by observing the italian occupational structure, which shows a share of the agricultual labor force reaching a peak of 69% in 1881. Further, in the same year, urbanization rate was on average 28%, meaning that most of the population was living in the countryside, and a considerable portion of it was working in the primary sector. Consequently, all the relevant social and work relations did not take place in the urban centers, and so had it been as late as the turn of the twentieth century, if not even further.

In sum, on the one hand, disentangling between cities and countryside and attaching less value to the role of urban centers in favouring and spreading civic orientations in the past does not allow me to discard Putnam's hypothesis and to conclude that my explanation is necessarily in contrast. On the other hand, this work suggests that a more careful attention must be paid to alternative institutional features, especially those aimed to manage relations between different social classes, often with opposed interests among them.

2.6.2 Why do we have short-term contracts only in some geographic areas?

In the previous section, I showed that short-term tenancy agreements are negatively and significantly associated with current social capital measures, both those capturing a pro-social behavior in civil society, according to a voluntary attitude of some community population, and those proxying compliance with rule of law. I rely on a bunch of geographic controls aimed to mitigate the probability to capture a spurious correlation between the fraction of daily farm workers and social capital. Nevertheless, past short-term contracts (before the land reform in 1950 took place) are likely to be associated with other omitted characteristics persisting to this

day and enhancing greater civic capital levels. For instance, more efficient labour market institutions at the local level, customized according to the employment structure of a territory, may have contributed to raise today's civic capital. To address this concern, I propose an original and unexamined hypothesis, which employs the presence of malaria as a source of exogenous variation in the adoption of short-term tenancy agreements in agriculture.

2.6.3 Malaria and short-term tenancy agreements

Malaria affects the settlement pattern of peasants, inducing them to shun the lowlands and dwell on top of hills. Then, lands cannot be properly cultivated throughout all the year, and extensive monocultural cereal farmings dominate. Single-crop choice of a similar kind demands work only at certain times of the year, involving an annual circulation of tenants (short-term leases). This results in the abandonment of lands and in the creation of the so-called *agro-towns*, particularly diffused in some southern regions (King and Strachan [1978]).

Several authors document the vicious circle putting together malaria, settlement pattern, crop choice and short-term tenancy contracts in agriculture. Rossi-Doria [1958] notes how instability remained everywhere the main feature of the peasants' condition, dominated by the precariousness of agricultural contracts. He argues that the nature of soils and climate both pushed toward monoculture, above all in the internal areas and along the coastal plains where malaria prevented any permanent settlement. Angelo Celli, a prominent member of the Deputy Chamber from 1892 and engaged in the fight against the disease, believed that malaria was the main driver of *latifundia* formation. According to his theory (Celli [1933]), a high correlation between malaria and the creation of large estates has been observed for centuries in the Pontine marshes, a plain in the surroundings of Rome. Similarly, Beauchamp [1988] observed the same pattern in Spain during the 1930s. Chaves [2013] tested Beauchamp's hypothesis using Markov chain models, finding robust evidence on the causal effect of malaria endemicity on *latifundia* creation in 1930s Spain. Specifically, the debilitating effects of malaria on farmers do not allow them to harvest crops and properly cultivate lands. This leads to the sale or abandonment of land, then purchased by few healthier and wealthier landowners. Thus, they will underutilize land as *latifundia*, based on extensive and land-intensive agriculture, requiring the labor of seasonal landless peasants. Hence, malaria affects the settlement pattern of rural workers, ultimately laying the foundations for the adoption of short-term agreements. This is confirmed by Curtis [2013], who argues that *latifundist* estates were cultivated almost entirely by agricultural workers, often on short-term agreements and even on a day-by-day basis. Snowden [2008] explicitly asserts that *latifundism* and malaria are synonymous because each one is at once cause and effect of the other. He adds that *latifundia* arose as an adaptation to the conditions imposed by malaria (Snowden [2008]). At the same time, however, the large estates consolidated

the influence of the disease known as "the king of the South". Further, he reports that at harvest and threshing time *latifundia* prompted extensive migrations of roaming labourers. These were peasants working on the basis of oral agreements and sometimes for meals alone, who were recruited in distant hill towns during the winter off-season to join work-gangs that journeyed to fields being at the same time the most fertile and the most perilous in the region.

2.6.4 IV results

I use malaria as an excluded instrument in all cross-sectional IV regressions. These are based on the same specification as in table 2.3, column II, and include as outcome variables, alternatively, all the measures of social capital employed in the previous section. The first-stage regression is expressed by the following equation:

$$Short - term_j = \alpha_2 + \beta_2 Malaria_j + \gamma_2 X' + u_i \tag{2.2}$$

where $Short - term$ is the proxy for short-term contracts, $Malaria$ is the share of geographic territory covered by malaria, and X is the same vector of covariates included in the second-stage regression expressed by equation 2.1.

Hence, our estimation hinges on the following assumption: for the spreading of malaria vector throughout the Italian territory to be a reasonable instrument for short-term tenancy agreements, it must affect civic capital measures in the present-day only through its effect on the percentage of daily farm workers. I argue that this is highly plausible, since the extension of malaria on the Italian territory depends on considerations of different nature, plausibly exogenous. Moreover, even though I do not observe a pre-trend in its expansion, I can reasonably assume that its intensity had been the same until the first point in time in which I observe it, i.e in 1880. Indeed, malaria is primarily influenced by the climatic pattern and by the characteristics of a territory (Sallares et al. [2002]), not subject to the time variable. The malaria parasite is transmitted from an infected individual to another individual by means of the female *Anopheles* mosquito. The parasite within the mosquito vector must go through a life-cycle process, whose duration mostly depends on ambient temperatures. The transmission becomes less likely to occur when the temperature falls below 18 degrees. Under 16 degrees, malaria parasites cease to reproduce definitely (Coluzzi [1999]).

IV results are reported in table 2.8. The coefficient of the share of daily farm workers on all the measures of social capital is negative and statistically significant. It is even strengthened, and it presents almost as twice as the magnitude effect I found in WLS estimates. For instance, in column I, a one standard deviation increase in the share of daily farm workers induces a 0.072 standard deviation decrease in the number of no-profit institutions over one thousand inhabitants. Moreover, at the bottom of the table I reported the F-stat for the first-stage

Table 2.8: IV estimates

IV regression	Ist.no profit	AIDO venue	Cars' inspections	Cars' insurance	Log soc. exp. (p.c.)
Day workers share 1881	-0.0626***	-0.0054*	-0.0037***	-0.0027***	-0.0231***
	0.0097	0.0031	0.0006	0.0007	0.0037
Elevation	0.4538	-0.3414***	-0.0603***	-0.0736***	-0.7875***
	0.4050	0.0820	0.0185	0.0186	0.0972
Max difference in elevation	0.7372***	0.0516	-0.0231***	-0.0159*	-0.0892**
	0.1789	0.0347	0.0083	0.0082	0.0404
City is on the coast	0.0433	0.0624	-0.0609***	-0.0598***	-0.1648*
	0.2153	0.0685	0.0154	0.0142	0.0892
City more than 5 km from the coast	0.0296	-0.0139	-0.0365**	-0.0417***	-0.1479**
	0.2655	0.0560	0.0148	0.0145	0.0709
Population	-0.6840	1.0754***	-0.0473	-0.1008	0.6896**
	0.7022	0.2066	0.0821	0.0788	0.3031
Population squared	0.2772	-0.3501***	-0.0131	0.0092	-0.1253
	0.2686	0.0791	0.0312	0.0303	0.1153
Gini land inequality 2001	1.4415***	0.3783***	0.1324***	0.0988**	0.9709***
	0.4591	0.0873	0.0445	0.0411	0.1510
Gini income inequality index 2001	6.5323***	2.8651***	0.2009	0.2676**	2.7463***
	2.1705	0.5407	0.1365	0.1300	0.6610
Constant	YES	YES	YES	YES	YES
N	7623	7623	7583	7583	7464
adj. R-sq	0.042	0.423	0.436	0.388	0.334
F	18.40	56.42	443.5	530.8	78.27
1st stage F-stat	54.49	54.49	53.94	53.94	49.49

Notes: 2SLS estimates with malaria employed as excluded instrument. Robust standard errors are reported in parentheses. First-stage F-stat reported at the foot of the table. ***Significant at 1%; **significant at 5%; *significant at 10%.

regression. All the estimates present a value well above ten, commonly known as the threshold value below which instruments are to be considered weak. A one-percentage point increase in the share of geographic surface covered by malaria causes a 0.21-percentage point increase in the share of daily farm workers in agriculture (coefficients not reported). This confirms the goodness of the choice and the relevance of the instrument, which is positively correlated with the variable of interest: it does seem to be its exogenous source of variation!

This finding corroborates my previous assumption of causality in the relationship between short-term contracts in preindustrial Italy and current civic capital levels, confirming that their negative relationship is not randomly determined.

2.6.5 Spatial analysis

An additional issue to face is represented by the presence of spatial autocorrelation. Indeed, the hypothesis that spatial clustering is a characteristic of the distribution of social capital over the italian territory cannot be discarded. This spatial pattern might be the result of the diffusion of social norms within a community by means of socialization or migration. In addition, the decision to invest in educating children may be the consequence of an emulative behaviour. Hence, the payoff attached to values like education, cooperation and solidarity may ultimately depend on the payoff attached to the same beliefs by nearby households (*keep up with the joneses*).

Spatial dependence is here addressed by employing three different specifications. First, I estimate a spatial error model allowing social capital levels to be affected by common unobserved factors in neighbouring municipalities. Although the previous specification includes a variety of control variables potentially influencing the decision of the households to invest in civic capital, other omitted variables that are correlated across space, such as institutional or ecological features, might not be orthogonal to the error term in equation 2.1. In this case, the disturbances would be spatially correlated. I account for this type of spatial dependence using a weight matrix that models each municipality's disturbances as being correlated to those of the municipalities within a radius of 50 km[20]. The error term is modeled as follows and is not correlated across space if $rho = 0$.

$$\epsilon = \rho W + v \tag{2.3}$$

Second, I rely on an alternative specification aimed to estimate a spatial autoregressive model, called spatial lag model, which includes a spatial lag of the dependent variable within

[20]We assume that spatial dependence affects districts that are within a radius of 50 km. The weighting matrix then is based on the inverse of the distance between locations within 50 km from each other. The results reported here do not change if we employ a spatial matrix whose entries are equal to one for observations that are contiguous and zero otherwise, thus linking each municipality's disturbances only to those of their neighbours (the results are not reported for the sake of brevity).

the set of the explanatory variables. Civic capital is then not only explained by local features but also by civic capital levels in close-by municipalities, thereby accounting for the possibility of some sort of spillover effects. Once again, the level of spatial dependence is structured by a weighting matrix that links civic capital levels in nearby municipalities (equation 2.4). Thus, the parameter λ captures the degree of spatial effect.

$$SocCap_i = \alpha + \beta short - term_j + \gamma X_i + \lambda W SocCap_i + \epsilon_i; j < i \tag{2.4}$$

Lastly, I combine the two preceding models into the more comprehensive specification known as "the general spatial model", and allowing for both sources of spatial dependence to occur: both spatially correlated errors and a spatial lag of the dependent variable among the regressors (equation 2.5).

$$SocCap_i = \alpha + \beta short - term_j + \gamma X_i + \lambda W SocCap_i + \epsilon_i; \epsilon = \rho W + v; j < i \tag{2.5}$$

Given the endogenous nature of short-term contracts, table 2.9 reports the IV/GMM results of estimating the previous spatial models using the presence of malaria as excluded instrument. The same set of controls employed in table 2.8 is accounted for in the analysis.

The first conclusion that emerges is that spatial dependence plays a prominent role in explaining civic capital. Both the parameters associated to spatial omitted factors, ρ and λ, in the spatial error model, in the spatial lag model and even in the conservative specification of the general spatial model are positive and statistically significant. The only exceptions are represented by the irrelevance of the parameter ρ in the specification using the dummy for the presence of an AIDO organization and in the general spatial model employing the number of no-profit institutions as the main outcome variables. This evidences that greater social capital endowments depend also on spatial omitted variables (such as further geographical and environmental characteristics, and shared social norms) and spillover effects. The second main finding is that the share of daily farm workers retains its significance even accounting for different sources of spatial dependence (except for the spatial lag model using the number of no-profit institutions as dependent variable).

Short-term tenancy agreements in preindustrial Italy have thus affected current civic capital levels. However, it is still not clear how in districts presenting a huge number of workers hired on daily or seasonal basis a low sense of civic engagement has handed down for generations and generations. Next section proposes a possible channel of transmission of the effect, trying to uncover the mechanism behind the observed relationship.

Table 2.9: Social capital and short-term contracts: spatial analysis

Dep. var.:	ist. no profit	ist. no profit	ist. no profit	AIDO venue	AIDO venue	AIDO venue	Cars' inspection	Cars' inspection	Cars' inspection
Day workers share 1881	-0.13***	-0.02	-0.10***	-0.00***	-0.00***	-0.00***	-0.01***	-0.01***	-0.00***
	(0.01)	(0.03)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
rho	-3.23***		-2.77	1.61		-8.16	2.41***		2.61***
	(0.96)		(1.77)	(5.11)		(7.29)	(0.10)		(0.13)
lambda		68.59***	74.97***		43.24***	39.19***		55.81***	55.07***
		(6.96)	(6.70)		(3.64)	(4.64)		(1.42)	(0.43)
Observations	7,623	7,623	7,623	7,623	7,623	7,623	7,623	7,623	7,623
Dep. var.:	Cars' insurance	Cars' insurance	Cars' insurance	Social expenses	Social expenses	Social expenses			
Day workers share 1881	-0.01***	-0.01***	-0.00***	-0.02***	-0.01***	-0.03***			
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)			
Controls	YES	YES	YES	YES	YES	YES			
rho	2.39***		2.64***	-4.59***		-4.81***			
	(0.10)		(0.13)	(0.36)		(0.46)			
lambda		55.61***	55.21***		109.32***	91.16***			
		(1.49)	(0.46)		(0.73)	(0.84)			
Observations	7,623	7,623	7,623	7,623	7,623	7,623			

Notes: For simplicity, the intercept is not reported. Each column refers to a different spatial specification: the Spatial Error Model, the Autoregressive Spatial Model and the General Spatial Model. All of them employ the presence of malaria as an instrument for the share of daily farm workers in 1881 (IV/GMM). The same set of controls employed in 2.8 is included in all specifications. ***Significant at 1%; **significant at 5%; *significant at 10%.

2.7 Mechanism of transmission

Besides the econometric analysis shown above, the question implying how an historical experience can permanently affect a community's outcome variable and being correlated with it even after a prolonged period of time calls for a deeper explanation. A consequence of such a long-term analysis relating observations from preindustrial societies to present-day outcome levels is that significant historical changes occurred in between might be overlooked. Moreover, the relation between the two variables might not be stable over time, and in some cases the sign could even be reverted at different stages of development (Austin [2008]).

The core of my argument is that the presence of daily and seasonal workers plays an important role in explaining current social capital levels. This claim is empirically underpinned by historical cross-country regressions of several proxies for present-day civic capital on my variable of interest in the past (see section 2.6). Yet, the use of the comparative method might invoke a misleading conception of "historical persistence", which is extensively common within a much broader literature in economic history based on historical regressions of a similar kind. In particular, here the natural question to ask is *how* short-term tenancy agreements negatively influenced civic capital and, of course, whether the correlation observed in the formal comparative analysis really points to historical causation. Indeed, by relying on a method focusing on the isolation of alleged causal variables rather than on a strategy that investigates their interaction with processes of long-term historical change, relevant insights might be lost.

A primary hypothesis put forth by Guiso et al. [2016] for Italy, in line with Banfield [1967], is that an historical experience or event in the past affects the attitude of the population belonging to the same community, and such a behaviour passes down to this day through socialization, oral transmission and education within the family. As for the role of free-city states, they refer to this cultural trait as "self-efficacy", borrowing the concept from Bandura [1995], who defines it as "the belief in one's capabilities to organize and execute the courses of action required to manage prospective situations". Another hypothesis is that formal or informal institutions taking shape during the historical experience at stake persist over time, thus carrying on their cultural heritage and keeping the civic engagement spirit alive. One may think, for example, of the explanation advanced by Bolt and Bezemer [2009] based on the role of state capacity and on the distinction between open-access *vs* limited-access societies (North [1991]) at the core of Africa's dismal growth performance in the postcolonial era. Or, again for Italy, guilds and associations created during the self-government experience during the *Middle Ages* survived their disappearance and are still present in several cities of the central and northern part of the country, although devoid of their previous economic and political purpose.

I propose an alternative explanation, that negatively links the adoption of short-term contracts to the presence of the so-called "industrial districts", an argument firstly put forth by

Ascoli and Paci [1983], and then widely discussed in Becattini [1989], Becattini et al. [2003]. An industrial district is defined as *"a socio-territorial entity characterized by the active coexistence (...) of a community of people and a population of industrial enterprises* (my own translation from Becattini [1989]). They started to develop after the Second World War, especially in some areas of the center and the north-east of Italy, and reaching full maturity during the Seventies. In 2009 they contributed to the export by about 43% of the total production. They are prevalently composed of an agglomeration of companies, generally of small and medium size, located in a limited and historically circumscribed territorial area. These firms are specialized in one or more phases of a production process and integrated through a complex network of economic and social relations. In such an environment, local socialization becomes an opportunity for exchange of information in business relations, not mediated by formal procedures or rules. Within the boundary of the same community, overlapped with the boundaries of the district itself, culture and the set of shared norms and values come into play. Indeed, the permanent grouping of economic agents in the same place usually implies their belonging to the same social environment, characterized by a common culture and, above all, by common implicit rules of behaviour (customs). Custom therefore assumes a central role in the functioning of the network of informal relationships that characterizes the life of businesses and of the district at large. Remarkably, informal relationships regulated by social norms of this kind entail the custom of mutual cooperation, based on reciprocal trust among private agents and between them and public institutions. This, in turn, allowed enterprises within districts to cut down transaction costs and to remain competitive despite their small size (Becattini et al. [2003], Trigilia [1999]).

2.7.1 Industrial districts and sharecropping

Ascoli and Paci [1983] and Becattini [1989], Becattini et al. [2003] refer to a pre-existing farming structure and to a particular land tenure, sharecropping, in order to explain the birth of the industrial districts. Sharecropping and small property in the countryside would have allowed the sedimentation of a peculiar work ethic, a culture of self-employment, representing in short a sort of preliminary entrepreneurial socialization. According to their model, subsequently criticized by Forni [1987], the areas presenting small businesses and diffused capitalism (*capitalismo diffuso*) are favored by the traditional presence of a type of agriculture characterized by small family ownership and by sharecropping activities. In this environment, all the pre-requisites for the diffusion of the industrial districts can be found. First, both parts of the tenancy contract, the landowner and the sharecropper, are involved in the production process, whose semi-autonomous organization is strongly oriented towards capital accumulation for internal investment. Second, the tenancy agreement envisages a risk-sharing component caused by a high required level of crop supervision due to their yield variability. Both elements contribute to mitigate social class

tensions. In addition, the low propensity of the sharecropper to perform duties exclusively for an external employer ensures that, at the time of urbanization, several peasant families reproduced peasant culture in the context of small family businesses, being them very flexible and adaptable to the "light" industry market (*industria leggera*). Finally, the countryside is served by a dense road network and the relationship between urban and rural population is intense. Solidarity relationships thrive within the extended family, where one can benefit from a farm (*podere*) for self-employed activity, and an atmosphere of collaboration favored by the limited social distance between small entrepreneurs and employees, often relatives, who share the same work ethic. This results in emulative behavior and working relationships inspired by cooperation rather than conflict (see Fuà [1983] and Zanotelli [2012]).

2.7.2 Testing the role of industrial districts

Although I provided qualitative evidence of a positive relationship between sharecropping and industrial districts, quantitative evidence confirming the proposed hypothesis is needed. I collected data from ISTAT reporting municipalities belonging to an industrial district in 2001. The variable takes on value one whether the municipality is part of an industrial district and zero otherwise. I regress this indicator on my variable of interest, the fraction of daily workers in agriculture over the total labor force engaged in agriculture in 1881. Of course, since the adoption of short-term contracts was in contrast to sharecropping activities, I expect them to be negatively related with districts (*circondarii*) containing a large number of municipalities being part of an industrial district.

Table 2.10 presents results of this test. In column 1, I simply ran a WLS regression with baseline controls; in column 2 I added dummies for macroregions; in column 3 I performed an IV regression using the presence of malaria as instrument and adding latitude among geographic controls, while, ultimately, I estimate a general spatial model in column 4, both adding a lagged spatial dependent variable within the set of regressors and allowing for disturbances being spatially-correlated (inverse-distance W matrix with a band of 50 km). All the estimates show a negative and statistically significant impact of short-term contracts on the presence of industrial districts; that is, it is less likely to find an industrial district where daily and seasonal workers were predominant in liberal age.

In order to show that such a mechanism of transmission is plausible, I need to show that where industrial districts are widespread, the level of civic engagement is higher too. Indeed, if individuals of a community are socially embedded, we should expect that they would participate more to the public good because this is a "customized" behaviour, entrenched in their culture. That is precisely what I do in table 2.11. While it is difficult to find causation, I can nonetheless test whether a correlation between the presence of industrial districts and the level of social

Table 2.10: Mechanism of transmission

Dep.var: industrial districts	Baseline spec.	Macroregions	IV results	General Spatial Model
Day workers share 1881	-0.0060***	-0.0039***	-0.0155***	-0.0036***
	0.0009	0.0011	0.0052	0.0013
Elevation	-0.2838***	-0.1405***	-0.2476**	-0.0116
	0.0531	0.0530	0.0999	0.0211
Max difference in elevation	0.0059	0.0073	0.0311	-0.0206**
	0.0217	0.0226	0.0307	0.0097
City is on the coast	-0.1792***	-0.1035***	-0.0842**	0.0014
	0.0300	0.0326	0.0399	0.0124
City more than 5 km from the coast	-0.1345***	-0.0826***	-0.0590	-0.0043
	0.0317	0.0307	0.0367	0.0176
Population	-0.4376***	-0.4326***	-0.3598	-0.2519
	0.1455	0.1584	0.2217	0.1545
Population squared	0.1583***	0.1463**	0.1568*	0.0960
	0.0555	0.0606	0.0860	0.0663
Gini land inequality 2001	0.0354	0.0231	0.0251	-0.0662**
	0.0862	0.0983	0.1203	0.0260
Gini income inequality index	-0.0804	-0.0739	-0.2096	-0.3076***
	0.3975	0.3975	0.5029	0.1038
Latitude			0.0000	0.0000***
			0.0000	0.0000
lambda				31.5671***
				0.9176
rho				87.0263***
				2.7862
Area dummies	NO	YES	YES	YES
Constant	YES	YES	YES	YES
N	7623	7623	7623	7623
adj. R-sq	0.160	0.185	0.071	
F	73.48	54.44	42.72	

Notes: WLS regression with baseline controls in column 1; WLS regression with macroregional dummies in column 2; 2SLS estimates with the addition of latitude in column 3; General Spatial Model with the inclusion of lagged dependent variable and spatially correlated errors in column 4 (band of 50 km). Robust standard errors are reported in parentheses in the first three columns; spatially correlated errors are reported in parentheses in column 4. ***Significant at 1%; **significant at 5%; *significant at 10%.

Table 2.11: Mechanism of transmission (part 2)

Dep. var.:	Ist. no profit	Ist. no profit	AIDO venue	AIDO venue	Cars' inspections	Cars' inspections
Industrial districts	0.3281**	0.3051**	-0.1296**	0.0412	0.1168***	0.0802***
	0.1427	0.1426	0.0550	0.0269	0.0152	0.0063
Controls	NO	YES	NO	YES	NO	YES
N	7951	7951	7951	7951	7904	7904
adj. R-sq	0.001	0.055	0.012	0.441	0.125	0.332
F	5.290	24.77	5.544	48.14	58.88	796.9
Dep. var.:	Cars' insurance	Cars' insurance	Soc. exp. (p.c.)	Soc. exp. (p.c.)		
Industrial districts	0.1105***	0.0751***	0.0799	0.1489***		
	0.0136	0.0058	0.0676	0.0316		
Controls	NO	YES	NO	YES		
N	7904	7904	7790	7790		
adj. R-sq	0.124	0.304	0.002	0.210		
F	66.35	679.6	1.397	81.28		

Notes: OLS estimates. Robust standard errors are reported in parentheses. ***Significant at 1%; **significant at 5%; *significant at 10%.

capital exists. I employ all my proxies for civic capital as dependent variables, and I run WLS regressions whether the dummy for the presence of industrial districts is the only explanatory variable or it is included within the set of baseline controls used in table 2.3, column 2. The results seem to be robust to every specification. Only cities with an organ donation organization do not present significant association with the variable of interest.

Overall, my conjecture seems to hold. The adoption of short-term contracts in agriculture in liberal age is negatively associated with the subsequent creation of industrial districts, which are in turn positively correlated with contemporaneous social capital. The only thing I am left with is to uncover whether the relationship unveils contributes to explain economic imbalances between North and South.

2.7.3 Macroregional estimates

In contrast to Guiso et al. [2016], my estimates are computed including all italian municipalities within the sample. Conversely, the authors consider only municipalities within the center-north. This has been possible because the experience of self-government in the *Middle Ages* was concentrated only in the central and northern part of the country, allowing them to exploit regional variation *within* the North to test Putnam's hypothesis. Therefore, their differentiation is not just North–South. In my case, however, a similar distinction cannot be reproposed in principle, as *braccianti* were clearly present in all italian regions. Nonetheless, I can split the sample in two subsamples in order to replicate the same empirical exercise. What I do is to

estimate regressions considering observations alternatively contained in the center-north and in the south samples (CN and S).

Table 2.12: IV estimates: split sample

IV regression: macroregions	Ist.no profit CN	Ist.no profit S	AIDO venue CN	AIDO venue S	Cars' inspections CN	Cars' inspections S
Day workers share 1881	-0.0365***	0.0116	-0.0084**	0.0052	-0.0036***	-0.0478
	0.0121	0.1439	0.0037	0.0418	0.0006	0.0698
Controls	NO	YES	NO	YES	NO	YES
N	5071	2552	5071	2552	5035	2548
adj. R-sq	0.023	0.080	0.426	0.434	0.576	-26.723
F	22.49	11.70	66.58	16.06	1584.0	0.467
1st stage F-stat	78.59	0.453	78.59	0.453	77.45	0.448
IV regression: macroregions	Cars' insurance CN	Cars' insurance S	Soc. exp. (p.c.) CN	Soc. exp. (p.c.) S		
Day workers share 1881	-0.0022***	-0.0468	-0.0150***	-0.0717		
	0.0007	0.0696	0.0039	0.1149		
N	5035	2548	5011	2453		
adj. R-sq	0.544	-27.144	0.333	-0.529		
F	625.3	0.357	77.12	5.227		
Fstat	77.45	0.448	71.84	0.436		

Notes: 2SLS estimates with malaria employed as excluded instrument. Robust standard errors are reported in parentheses. First-stage F-stat reported at the foot of the table. ***Significant at 1%; **significant at 5%; *significant at 10%.

The results are shown in table 2.12, with the same model specification employed in table 2.8 (the coefficients of baseline controls are not reported). All civic capital measures are used as outcome variables. The parameter of interest associated with the share of daily farm workers is negative and statistically significant only in the center-north sample, while it is not different from zero in the south sample. Similarly, malaria pervasiveness contributes to the adoption of short-term tenancy contracts only in the center-north, as can be derived from the evaluation of the F-stat of the first-stage regression.

This evidence corroborates the findings reported in the previous section. Without the creation of the industrial districts, the aptitude for cooperation would not have persisted to this day. Indeed, the phenomenon of the industrial districts involves prevalently certain areas of the center-north, while it can be found only in a few parts of the *Mezzogiorno*. Thoroughly, although some places of the southern adriatic coast present small industrial districts and the involved municipalities have increased in number in the last decades, the scale of the phenomenon is still small in proportion to its counterpart in the center-north, and in any case not into an extent able to trigger a process of social capital accumulation. The findings show that it is then necessary the imposition of a new institutional setting that embodies such a cultural trait to transmit it over time.

2.8 Conclusions

Acemoglu and Robinson [2012] argue that extractive institutions in the past shaped different paths of development across countries and can then affect economic outcomes even after a long period of time (long-term persistence). Nevertheless, it is still not clear whether those institutions either directly affect long-run growth or through their effect on culture. By looking at the specific case-study of Italy and its mysterious North-South divide, I argue that the agrarian structure of the economy and its institutions before the land reform took place in 1950 are at the origin of differences in social capital levels recently registered.

In this paper, I try to look at the proportion of daily farm labourers in Post-Unification Italy at district-level in order to assess whether they had an impact on several indicators of social capital in the present-day (both those proxying a prosocial behaviour and those indicating compliance with rule of law). I find that municipalities that were part of districts with a high share of short-term contracts in liberal age exhibit low civic capital today. The results show that the observed relationship is causal once using the presence of malaria as an excluded instrument and controlling for spatial dependence. This has important implications for understanding the mechanisms behind the formation of differences in social capital levels in the first place, regardless of the effect on economic outcomes once they are shaped.

Having established a long-term effect of my variable of interest, I try to uncover the mechanism behind the observed relationship. I assert that without the creation of the industrial districts the spirit of civic engagement would not have transmitted for generations and generations. Mutual cooperation is indeed the fundamental characteristic of people and firms operating within industrial districts. They flourished prevalently in the Center-North, where sharecropping activities, characterized by long-term and risk-sharing agreements, were mostly diffused. Consistent with my conjecture, I find that areas exhibiting a high share of short-term contracts are negatively related to the presence of industrial districts. Similarly, splitting the sample in the two subsamples of Center-North and South, the negative association between short-term contracts and civic capital is only found in the former case. This result corroborates the view that industrial districts have been fundamental to transmit the values of cooperation and common good up to this day.

In sum, short-term relationships in the labour market with a distorted bargaining power in favor of one of the two agents induce an opportunistic behaviour of the other. While this aptitude can persist through time and rarely be changed, a new institutional setting reproducing a different incentives structure should suddenly have the opposite effect.

Finally, this work puts the accent on a different concept of the cultural trait then translating into higher civic engagement. As the anthropologist Sahlins argued (Sahlins [2010]), the idea that our personal interest is embodied in the common interest has been transformed into its

opposite, i.e. common interest thrives if everybody behaves as a utility- or profit-maximizing economic agent. Similarly, Guiso et al. [2016] point to the way people rationalize success and failure (self-efficacy) to explain how civic capital handed down through centuries. They assert that people with high self-efficacy are more likely to attach success to effort and failure to bad luck and, conversely, people with low self-efficacy exert little effort because they will attribute success to luck and failure to lack of effort. By contrast, the mechanism of transmission based on the role of the industrial districts lies on the conjecture that the maximizing behaviour of the private agents hinges on the network of interdependent social relations and cooperation among private agents in the same community and between them and the local public institutions. Had cooperation and social relations been non-existent, not only trust among people would not have flourished, but also the small and medium firms of a district would not have been as competitive as they are today.

Further research should devote more effort to disentangle between the transmission of these crucial elements *via* socialization and education or through the creation of new institutions.

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2.9 Appendix

Table 2.13: Description of the variables

Variable name	Description	Source
Number of nonprofit organizations	Total number of nonprofit organizations (sum of voluntary associations, social cooperatives and foundations, excluding church-based organizations) at a municipal level scaled by municipal population	ISTAT (National Statistics Institute), 2001 census. Source: Guiso, Sapienza and Zingales, 2006
Presence of an organ donation organization	Indicator of existence of an organ donation organization in the municipality (dummy variable).	http://ww.aido.it/ Source: Guiso, Sapienza and Zingales, 2006.
Current population	Number of inhabitants in the municipality in the 2001 census.	ISTAT (National Statistics Institute), 2001 census.
Gross per capita disposable income	Disposable income per capita: euros in year 2000.	Ancitel (2003) Source: Guiso, Sapienza and Zingales, 2006.
Gini income inequality index	Computed using data on the pre-tax income distribution in year 2000 based on information from the 2001 census.	Ancitel (2003) Source: Guiso, Sapienza and Zingales, 2006.
Gini landownership inequality index	Computed using data on the size distribution of agricultural firms in year 2000 based on information from the 2001 census.	Ancitel (2003) Source: Guiso, Sapienza and Zingales, 2006.
Cars inspection	Percentage of automobiles presenting a regular inspection	http://dati.mit.gov.it/catalog/dataset/parco-circolante-dei-veicoli Source: Ministry of Infrastructures and transports.
Cars insurance	Percentage of automobiles presenting a regular insurance	http://dati.mit.gov.it/catalog/dataset/parco-circolante-dei-veicoli Source: Ministry of Infrastructures and transports.
Municipality by the sea	Dummy that takes on value 1 if the municipality is on the coast and 0 otherwise.	Ancitel (2003) Source: Guiso, Sapienza and Zingales, 2006.
Municipality located near the sea (within 5 km)	Municipality located in a bandwidth of 5 km from the sea.	Ancitel (2003) Source: Guiso, Sapienza and Zingales, 2006.
Municipality elevation	Measured in meters from the sea.	Ancitel (2003) Source: Guiso, Sapienza and Zingales, 2006.
Max difference in elevation	Difference between the altitude of highest and lowest point in the municipality territory, in meters.	Ancitel (2003) Source: Guiso, Sapienza and Zingales, 2006.
Latitude	Computed using the "y" centroid in Istat municipal shapefiles.	ISTAT (National Statistics Institute), 2001 census.
Daily farm laborers (post-Unification)	Computing its percentage over the total agrarian labor force	Population census (1881)
Indutrial districts	dummy variable (=1 whether the city belongs to an industrial district, =0 otherwise)	Census of Industry and Services, ISTAT, 2001.
Malaria presence (post-Unification)	Ratio of the municipal surface infested by malaria	Digitalization of Torelli map "Carta della malaria d'Italia", drawn in 1881.

Chapter 3

Stepping into the past: a reconstruction of the Italian provincial population (1770 ca.-1861)

We present the first ever population series at provincial level in Italy since 1770 ca. The new data reveal, in line with national figures, two different regimes: one before 1821, characterized by low population growth, and another after 1821 with higher rate of population growth. Low growth regime is interpreted as the longest tail of population depression started after the plague's waves of 17th century and prolonged by the Napoleonic wars. By contrast, the high growth regime shows a substantial persistence of population growth rates and no sign of convergence, perhaps due to different economic growth patterns. Some exceptional cases of faster growth match the consensus that these areas were at the core of the Italian economic growth before Unification, i.e. Florence and Milan.

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3.1 Introduction

The understanding of Italian economic history should consider the regional imbalances of its long-term development. For this reason, any informed analysis on the root causes of regional inequality should be built upon a solid quantitative basis. This urgency is even more compelling for the pre-unitary period in order to quantify economic and social phenomena before Unification. In recent years, Ciccarelli and Groote [2017] provided nineteenth century figures for provincial railways endowments and Ciccarelli and Weisdorf [2019] reconstructed provincial literacy rates since 1821 onward. Population dynamics reconstruction is therefore one of the very preliminary steps to pioneer into the past.

This paper provides the first time series of Italian provincial population since 1770 ca. up to 1861 at some benchmark-years. Our methodology relies on both primary and secondary sources and makes use of disaggregated data in order to account for several boundary changes that occurred since 1765 onwards. The bottom-up approach allows us to obtain pre-unification provincial population at borders of 1871, making it comparable with the correspondent figures already available for the Post-Unification period. The new provincial data unveil the existence of different pattern of population growth that neither the overall figures for Italy nor regional data unfold. The main findings of our preliminary analysis suggest that: *i)* Italy's population growth in the period 1791-1861 can be divided in two different demographic regimes: the low growth regime from 1791 to 1821 and the high growth regime 1821-1861; *ii)* a handful of provinces, notably the ones in the core Tuscany and Milan, grew faster than the Italian average in the low growth regime; *iii)* some provinces grew slower in the high growth regime; *iv)* convergence in growth rates is effective before 1821 and undetected from 1821 to 1861.

There are several reasons to carry out this exercise. First, having detailed demographic information for a period whose data are scarce is highly informative for economists and historians, as the demographic transition of a country represents a crucial tool to analyze its process of development and growth. Second, local population data permit to study within-country variability of different demographic patterns. Third, the reconstruction of the provincial distribution of population before 1861 represents the first step for building new quantitative evidence on the pre-unitary period.

History of population in Italy has motivated a wide range of researches. Preindustrial population dynamics has been used to analyze the decline of Italian economy since the 17th century. Guido Alfani in a series of papers (Alfani [2010, 2018], Alfani and Percoco [2019]) has pinpointed that the episodes of plagues during the period 1629-1657 reduced the population trapping in a low growth regime the Italian economy until 1800. Lower population did not enhance living standards, through higher real wages, because plagues destroyed human capital turning into a debasement of labour demand. On the contrary, Capasso and Malanima [2012]

offer a different perspective. These authors consider the restore of population growth after 1700 as a sign of decline. Higher population depressed real wages and lowered living standards until the Unification of Italy (1861). However, a recent reconstruction of the long run series of real wages for Italy in the preindustrial era shows that the decline started after the epidemics episodes, in line with Alfani's view, and reinforced during the 18th century (Rota and Weisdorf [2020]).

Previous studies, constrained by data scarcity, used city-level population or national and macroregional figures for testing competing theories. Yet, little has been done in historical research to provide continuous and systematic population time series at a detailed territorial level. In this respect, historical research would be much more useful if quantitative information had gathered rather than keep speculating on methods and methodologies to be used. Furthermore, since economic development is a prevalently regional phenomenon, economic historians have been much more interested in collecting data for intermediate territorial divisions, i.e. regions and provinces. In this respect, Italian demography represents an interesting case study, as regional disparities are to be traced back to the past. Early studies on population provided national figures and macro-regions reconstructions before the unification (see Bellettini [1973] and Del Panta [1996]). Galloway [1994] made the first systematic attempt to estimate regional populations for key areas in the North of Italy. Additional regional data have been provided by Travaglini [1933], Romani [1968], Cipolla [1965]. In the present work, we improve demographic data by providing new estimates for all the Italian provinces in the period 1770 ca.-1861 at the borders of the Liberal Age and we discuss the preliminary implications of our new series.

The rest of the paper runs as follows. In the next section, we provide an overview of our data reconstruction, while in Section 3.3 we assess their consistency with alternative sources. In section 3.4, we provide some indications about the two different demographic regimes we found, whereas we discuss the main findings in Section 3.5. Section 3.6 concludes.

3.2 Data reconstruction

In this section, we provide an overview of the Italian polities from 1770 ca. to 1861 and a general outline of the process of reconstruction of the provincial population in the pre-unitary period at benchmark years. As all macroeconomic and demographic research agenda relies on administrative data, often coming from censuses, parish documents or tax registers, the unit of observation in historical researches has always been subdivided according to the administrative picture. For this reason, most of the time it is meaningless to compare values referred to different political entities that have taken place throughout the entire pre-unification period, because of the different territorial extension. Therefore, we strived to take into consideration

all the administrative changes in boundaries occurred from the late eighteenth century to Unification. During its entire history, Italy was divided in several political entities that frequently changed their administrative structures. During the pre-Napoleonic period, the main ancient states were: Kingdom of Sardinia, Republic of Genoa, Duchy of Milan, Duchy of Parma and Piacenza, Republic of Venezia, Duchy of Modena and Reggio, Duchy of Massa and Carrara, Duchy of Lucca, Granduchy of Tuscany, Principality of Piombino, Papal State, Kingdom of Naples, and Kingdom of Sicily. After the Restoration, the administrative subdivision dramatically changed, and the Italian peninsula was reordered into the following states: Kingdom of Sardinia, Lombardo-Veneto, Duchy of Parma and Piacenza, Duchy of Modena and Reggio, Duchy of Lucca, Granduchy of Tuscany, The Papal states, and Kingdom of the Two Sicilies.

The heterogeneity of our sources prevents the use of a unique methodology for all the provinces, as pre-unitary polities' censuses were intermittent, scarce and, in some case, incomplete. Moreover, long phases of foreign dominations, such as the French and Napoleonic political control, substantially complicate the picture. Hence, we proceed by past political entities accounting for infra-polities territorial changes and within polities administrative relocations[1]. We made use, when possible, of primary sources, mainly pre-unitary censuses[2], and of secondary sources related to specific periods and regions. When only partial information are available, we rely upon assumptions to correct the figures, in order to make them as comparable as possible to the rest of the values. We explain in detail how we reconstructed population values at unitary borders for each province in the Appendix of this paper where we also present provincial time series. The benchmark years for which we collect information are reported in Table 3.1, whereas in figure 3.1 we report the correspondent annual provincial population growth rates, averaged over the period under analysis.

3.3 Consistency of the new data

Several attempts to reconstruct a trend in the total Italian population have been made so far. After the seminal works by Beloch [1888], Travaglini [1933], Carlo Maria Cipolla published a preliminary reconstruction of the Italian demographic history of the early modern age (Cipolla [1965]). Bellettini [1973] provided a series of the Italian population by century from the birth of Christ, relying on Beloch's data too. Further, some minor revisions have been made by Del Panta [1996], who employed the same data to reconstruct a series for the Italian population

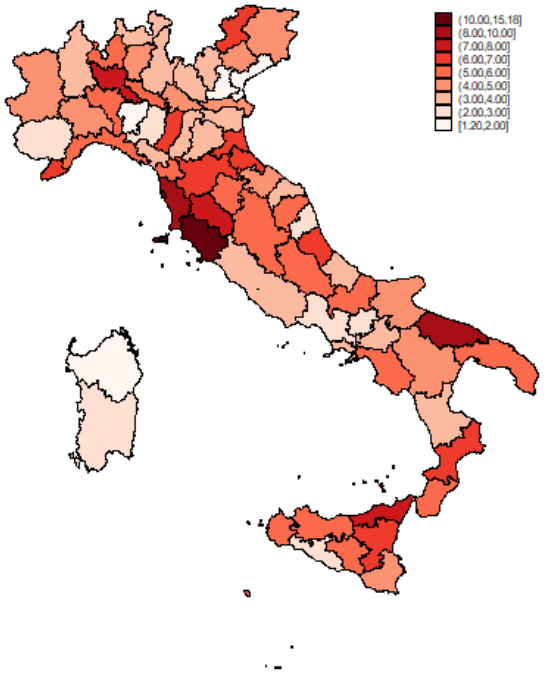
[1] We take into consideration the annexation of the Venetian provinces, which took place in 1866 after the Third War of Independence, and that of Rome in 1871. For this reason, sometimes we use "borders in 1871", "borders in liberal age", and "borders at Unification" with the same meaning.

[2] Population censuses carried out by pre-unitary states have been particularly useful, as municipal or district-level data were reported. These information have been compared to municipal figures drawn from the 1861 Population Census in order to construct the provincial population at unitary borders.

Table 3.1: Benchmark years by region and province existing in 1871

Regions	Provinces	Benchmark years
Piedmont	All provinces	1774, 1819, 1824, 1830, 1839, 1828
Liguria	All provinces	1788, 1797, 1819, 1824, 1830, 1839, 1848
Lombardy	Sondrio, Como, Milan, Bergamo, Brescia, Cremona, Pavia	1774, 1805, 1813-14, 1820-21, 1830-31, 1840-41, 1850-51
	Mantua	1771, 1805, 1813-14, 1820-21, 1830-31, 1840-41, 1850-51
Veneto	All provinces	1766, 1823, 1843, 1852
Emilia Romagna	Bologna, Ferrara, Forlì, Ravenna	1769, 1782, 1811, 1816, 1833, 1844, 1853
	Modena and Reggio Emilia	1770, 1775, 1790, 1803, 1850
	Parma and Piacenza	1787, 1814, 1820, 1839-45
Tuscany	Siena, Florence, Arezzo, Pisa, Lucca, Grosseto	1765, 1784, 1794, 1810, 1820, 1830, 1840, 1850
	Livorno	1778, 1790, 1810, 1820, 1830, 1840, 1850
	Massa-Carrara	1750, 1800, 1810, 1820, 1830, 1840, 1850
Marche	All provinces	1782, 1811, 1816, 1833, 1844, 1853
Perugia (Umbria)	All provinces	1769, 1782, 1816, 1833, 1844, 1853
Rome (Latium)	All provinces	1769, 1782, 1811, 1816, 1833, 1844, 1853
Abruzzo	All provinces	1765-66, 1788-90, 1819, 1828, 1840
Campania	All provinces	1765-66, 1788-90, 1819, 1828, 1840
Molise	All provinces	1765-66, 1788-90, 1819, 1828, 1840
Apulia	All provinces	1765-66, 1788-90, 1819, 1828, 1840
Basilicata	All provinces	1765-66, 1788-90, 1819, 1828, 1840
Calabria	All provinces	1765-66, 1788-90, 1819, 1828, 1840
Sicily	All provinces	1748, 1798, 1816-17, 1819-20, 1831-32, 1836-1861
Sardinia	All provinces	1782, 1819, 1839, 1844-45, 1848

Figure 3.1: Annual provincial growth rates per thousand (1785 ca.-1861)



Notes: Provincial growth rates over the period 1785 ca.-1861. The first available year for Parma and Piacenza is 1787, while for Genova and Porto-Maurizio is 1788.

from the Middle Ages onward. Lo Cascio and Malanima [2009] also worked out on Beloch's figures to provide alternative estimates, whereas data drawn by Travaglini [1933] distinguish from the other authors as they report figures referred to borders in 1911. In this Section, we compare our estimates with their values.

Table 3.2: Italian population: comparison with other sources

Year	Our own estimates	Bellettini & Cipolla	Lo Cascio & Malanima	Del Panta et al.	Travaglini
1750	\	15.3	15.5	15.8	
1790	17.78				17.48
1800	18.1	17.8	18.1	18.3	17.86
1820	19	20.4	\	19.5	19
1840	22.3	23.3	\	22.9	22.35
1850	23.86	\	\	24.7	24.16
1861	25.01	26.1	26.9	25.7	25.01

In Table 3.2, we can observe how our own estimates for the total Italian population are in line with the values registered in the main works previously mentioned. Indeed, our own estimates substantially coincide with the figures drawn by Travaglini [1933], referred to the total population registered in Italy at unitary borders. By contrast, Bellettini, Cipolla, Del Panta and co-authors, as well as Lo Cascio and Malanima consider a different area to compute the Italian population. Specifically, their estimates refer to republican borders, while we are consistent with boundaries in 1871, when the process of Unification was over. Indeed, the area of the newly formed state was not destined to remain the same through time. After the incorporation of Veneto (1866) and Rome (1870), the area of modern Italy varied from 259320 square kms in 1861 to 286610 in 1871. In 1919 it measured about 310120 square kms, while in 1947 it stabilized to an area of 301181 square kms. As Malanima [1998] noted, the practical choice by historians has been that of assuming an extent comprised between 300000 and 315000 square km, depending on the exclusion or inclusion of border territories such as Nizza, Savoy, Corsica, Trentino, Trieste, Gorizia, and Istria. Bellettini [1973], Cipolla [1965] declare that their population values are calculated in relation to a standardized area of 301000 squared kms as Del Panta and co-authors do. Such a difference can be simply verified by looking at the figures provided for 1861. Our estimate corresponds to the total Italian population reported in the corresponding census. More generally, our own estimates do not coincide with the values provided by the other scholars along the whole nineteenth century, perhaps because of the different territorial extension taken into consideration.

Table 3.3: Macroregional estimates: comparison with other sources

Year	Bellettini	Del Panta	Our own	Bellettini	Del Panta	Our own	Bellettini	Del Panta	Our own	Bellettini	Del Panta	Our own
		North			Center			South			Islands	
1750	6.5	7.7	7.8	3.1	2.4	2.6	3.9	3.9	4.02	1.77	1.8	1.9
1800	7.2	8.5	8.15	3.6	2.8	2.87	4.8	4.9	4.97	2.1	2.1	2.1
1850	\	11.4	10.68	\	3.8	3.95	\	6.8	6.53	\	2.7	2.69

Notes: Bellettini includes Piedmont, Lombardy, Venetian territories and the Duchies in the North, the Granduchy of Tuscany and the Papal State in the Center, the Kingdom of the Two Sicilies (continental part) in the South, and Sicily and Sardinia in the Islands. Del Panta et al. refer measures to current borders. Our estimates for 1750 are postdated to the first available year for each province. Hence, they ought to be slightly overestimated.

In Table 3.3, the values for macroregions are reported, along with the corresponding estimates provided by Bellettini [1973] and Del Panta [1996], in order to make them easily comparable. Apart from some small differences, our figures fit them at each point in time. The only relevant imbalance comes from the different construction of the macroregion "North" with respect to Bellettini's work. He does not include Bologna, Ferrara, Forlì, and Ravenna in the North, but the corresponding population is computed within the macroregion "Center". Both Del Panta et al. and Bellettini's works include Trentino and Trieste.

In Table 3.4, we report population values for the Italian regions, following the same territorial subdivision used by Cipolla [1965], Romani [1968] and Travaglini [1933][3] Overall, our measures coincide with Travaglini's figures, because of the same territorial extension of the regions and polities under analysis. Negligible imbalances emerge from the estimation of Tuscany in 1820 and 1840. Such an overestimation may be due to the presence of the district of Rocca San Casciano, belonging to the Papal State up to Unification that Travaglini does not include. The other relevant disparity can be observed for Sardinian population at the end of the eighteenth century. By contrast, Cipolla and Romani do not account for internal administrative boundary changes, allowing for frequent differences with our estimates.

[3]The same table is reported in Cipolla [1965], pag. 571 but with a different territorial area considered for the regions.

Table 3.4: Regional population estimates at different benchmark years

Author	Year	Piedmont	Lombardy	Veneto	Liguria	Tuscany	Papal States	Two Sicilies	Sardinia
Our estimates	1770	2.08 *(1774)*	2.1 *(1774)*	1.7	0.52 *(1788)*	1.1 *(1778)*	2.1*	5.65	0.497 *(1782)*
Cipolla	1770	2.1	1.1 *(different area)*	2.2 *(different area)*	*0.5*	1	2.2	5.6	0.4
Romani	1770	/	/	/	/	/	/	/	/
Travaglini	1770	2.5 *(includes Liguria)*	2.1	1.7	/	1.1	1.95	5.6	0.36
Our estimates	1820	2.1	2.4	1.9	0.59	1.36	2.4	6.9	0.49
Cipolla	1820	2.2	2.2	1.9	0.6	1.3	2.5	7.2	0.5
Romani	1820	2.2	2.2	2.0 *(1828)*	0.58 *(1817)*	1.2 *(without Lucca)*	2.4	7.2	/
Travaglini	1820	2.7 *(includes Liguria)*	2.4	1.9	/	1.32	2.4	7.0 *(Sicily in 1825)*	0.395
Our estimates	1840	2.5	2.8	2.1	0.71	1.75	2.829	8.14	0.53
Cipolla	1840	2.5	2.5	2.2	0.7	1.7	2.8	8.1	0.5
Romani	1840	2.68 *(1838)*	2.5	2.16	0.697 *(1838)*	1.495 *(without Lucca)*	2.77	8.2	/
Travaglini	1840	3.25 *(includes Liguria)*	2.8	2.1	/	1.66	2.77	8.2	0.55

Notes: Population is in millions. Values for the provinces of Marche within the Papal States are taken in 1782. The Papal States include the provinces of Rome, Perugia, Ancona, Ascoli, Macerata, Pesaro-Urbino, Bologna, Ferrara, Forlì and Ravenna. All the values are expressed at borders in 1871. Travaglini takes into account the same geographical area we do, whereas Cipolla and Romani gathered values at republican borders.

In Table 3.5, we report population growth rates resulting from our own elaborations referred to the full set of Italian regions in the two subperiods 1775 ca.-1820 and 1821- 1861. We compare them with the same growth rates reported in Del Panta [1984], pag. 28. Generally, the estimates do not differ enormously, whenever the boundaries coincide, as in the case of Piedmont, Lombardy, Veneto, Sicily, and nineteenth century Tuscany. Marche is a notable exception, although Del Panta et his coauthors report population at boundaries in liberal age, taken from Bonelli [1967]. In this case, the discrepancy in growth rates are due to the fact that neither Del Panta et al. nor Bonelli provide proper data for the eighteenth century. Likewise table 3.4 our estimates for Sardinia diverge from previous works, to the extent that they use Corridore [1990] rather than the more accurate data provided by Beloch et al. [1994].

3.4 Two demographic regimes

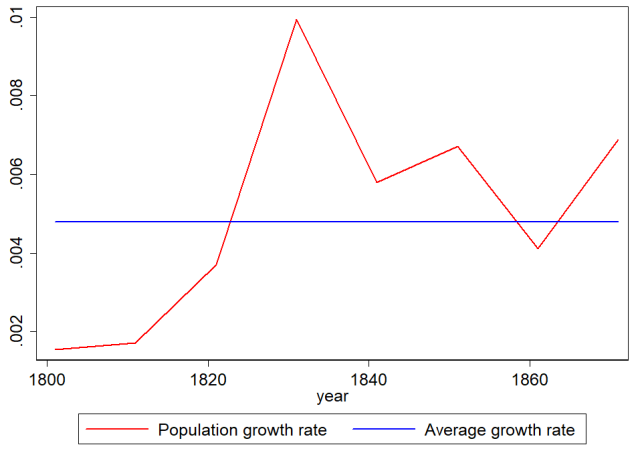
The long-term Italian demography reveals two distinct regimes. The first falls in the period 1791-1821, which was a low demographic growth regime featured by growth of population below the secular average. The second regime, instead, began in 1821 and reinforced after Unification. In the second phase, population growth rates were fairly higher than the secular trend (see Figure 3.2). Our preliminary interpretation points to two main reasons why the period 1791-1821 is a low growth regime for population.

Table 3.5: Population growth rates (per thousand inhabitants)

Region	Period	Del Panta et al.	Our	Period	Del Panta et al.	Our
Piedmont				1824-1861	5.9	5.7
Liguria	1805-1822	3.9	4.2	1822-1861	5.6	6.6
Lombardy	1789-1821	3.9	3.6	1821-1861	7.2	7.2
Veneto	1789-1821	1.8	1.5	1821-1861	5.6	5.3
Parma-Piacenza/	1814-1821	-2.5	2.6	1821-1861	5	5.2
Modena-Reggio Emilia						
Emilia (Romagna)				1833-1861	5.6	6.9
Tuscany	1794-1814	3	3.9	1821-1861	8.9	8.8
Marche	1782-1827	3.1	4.1	1827-1861	4.4	3.7
Umbria	1782-1827	2.4	4.7	1827-1861	7.7	6.6
Latium	1782-1811	-4.4	-4.7	1833-1853	6.6	6.1
Abruzzi	1793-1828	6.1	4.2	1828-1861	4.2	4.5
Molise	1789-1821	4.9		1828-1861	3.9	
Campania	1789-1821	2.7	3	1828-1861	3.8	3.4
Apulia	1789-1821	4.8	5.6	1828-1861	8.3	6.9
Basilicata	1789-1821	3.1	4.3	1828-1861	3.7	3.7
Calabria	1789-1821	5.4	4.8	1828-1861	5	4.7
Sicily	1798-1831	4.6	4.9	1831-1861	7	6.93
Sardinia	1782-1821	1.4	-2.92	1821-1861	6.1	4.5

Notes: Del Panta computed population growth rates using provincial borders in 1980. The value for Abruzzi counts the population of Molise. We have not reported the rate for Emilia-Romagna in the first period because Del Panta has no data.

Figure 3.2: Italian population growth rates



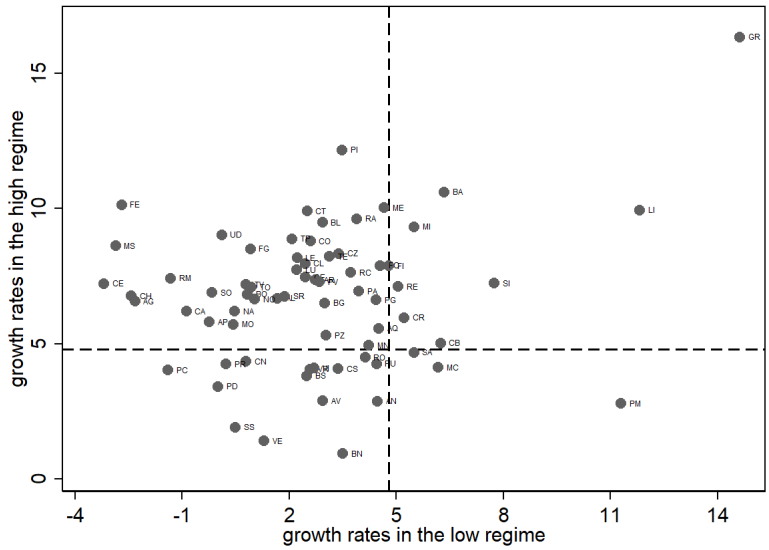
Notes: Population growth rate and average growth rate over the considered time span.

First, it was the result of the long waves of epidemics started in 1630 and lasted until 1800 (Alfani [2018], Alfani and Percoco [2019]). Second, the long depression was occasionally prolonged by the outbreaks of Napoleonic wars that depressed population growth by increasing mortality rates and reducing food availability in Italy through the Napoleonic blockage (Federico and Dincecco [2018]). The high growth regime began after the Restoration. At a first glance, population grew probably as the result of a rebound effect after the long depression. Moreover, the lack of persistent epidemics and an incipient industrialization process sustained population increases. A further interesting fact we find is the lowering of growth rates in 1831-41, because of a famine (Alfani [2018], Fusco [2012]), and above all of the occasional spreading of cholera epidemics (Del Panta [1996]). Indeed, the cyclical downturn of population growth is concomitant with the first cholera epidemic that hit Italy in 1835-1837. It was the first time cholera assumed pervasive power penetrating all preunitary kingdoms and sparing few areas.

Provincial data provide us with some notable exceptions to the national patterns. In figure 3.3, we show the annual provincial growth rates in the two periods, compared to the secular Italian population growth rate. On the one hand, in the left-hand side of the graph, we observe the provinces performing worse than the Italian average in the first period. On the other hand, in the right-hand side we can find the provinces above the average. The same reasoning applies with regard to the second regime, with provinces above and below the secular population growth rate (this time with respect to the y-axis).

During the low regime, we have identified a group of provinces that grew faster than the national average. They are gathered in the core of Tuscany and in the area stretching from

Figure 3.3: The two demographic regimes at province-level



Notes: Provincial population growth rates in the first period, 1775 ca.-1821 (x-axis), and in the second period, 1821-1861 (y-axis) are expressed in thousands per year. The dashed lines correspond to the Italian growth rate per thousands, averaged over 1775 ca.-1861.

Milan to Cremona. Other areas above the national average are sparse and without any specific geographic polarization. In the subsequent phase, 1821-1861, almost all the provinces grew above the Italian secular average following the national growth pattern. A group of provinces, conversely, grew slower. The provinces with lower growth rates are located in western Veneto, eastern Lombardy, Campania and Marche. Again, the other few scattered provinces that depart from the long-term growth do not show any exclusive spatial distribution.

To provide additional proof of the existence of two demographic regimes, we move one step forward, and we analyze whether we register unconditional convergence in population growth rates.

Table 3.6: Population growth rate. Dependent variable: population growth rates at provincial level.

	1775-1821	1775-1821	1775-1821	1821-1861	1821-1861	1821-1861
	(1)	(2)	(3)	(4)	(5)	(6)
log(pop1775)	-0.0985***	-0.1127***	-0.0974**			
	0.0298	0.0313	0.0398			
log(pop1821)				-0.0478	-0.043	-0.022
				0.0319	0.0331	0.0391
Constant	1.3547***	1.4939***	1.2465**	0.8600**	0.7971*	0.5874
	0.3703	0.3809	0.5277	0.4005	0.4229	0.5168
Macroregions	NO	YES	NO	NO	YES	NO
Regional dummies	NO	NO	YES	NO	NO	YES
N	69	69	69	69	69	69
adj. R-sq	0.194	0.322	0.286	0.044	0.025	0.227
F	10.9	6.996	.	2.241	0.813	.

Notes: OLS estimates. Robust standard errors are reported in parentheses. ***Significant at 1%; **significant at 5%; *significant at 1%. The value of the initial population is taken in 1778 for the Tuscan provinces, in 1782 for the provinces in Marche and Sardinia, in 1788 for Parma and Piacenza and the provinces of Liguria, in 1774 for the rest of the sample.

When we consider the entire sample with 69 provinces (Table 3.6), two patterns are visible: β-convergence is found in the 1775-1821 period, while we do not find the same evidence for the period 1821-1861. In column 2 and 3 we control for the inclusion of, respectively, macroregions and regional dummies, and the results do not vary. In column 5 and 6 we repeat the same exercise for the subsequent period, and still the level of significance does not change. In Table 3.7 the sample is restricted to the inclusion of only 16 regions. We assess β-convergence for the same two subperiods, both unconditional and with the inclusion of macroregional dummies in order to capture unobservable heterogeneity common to macroareas. We do not find significant

results for every specification. However, the sign of the coefficient associated with the lagged dependent variable is negative in the first period, but it becomes positive in the second period, meaning that a process of divergence was taking place (even though not significantly).

To have a clear vision, we reported a graph with four scatterplots associated with columns 1 and 4 of Table 3.6, and columns 1 and 3 of Table 3.7 (the regressions evaluating unconditional convergence). It is straightforward to observe the presence of unconditional convergence in population growth rates at province-level in the first period, culminating with the end of the Napoleonic wars and the Restoration (see figure 3.4). The least populated areas were catching up with the most populated ones to a significant extent. By contrast, during the "Risorgimento", such a pattern is not visible, if not in a non-significant way. Looking at regional scatterplots the landscape is not different. All the Italian regions follow the dual regime with no exceptions. A convergence process is at stake in the low regime, whereas divergence in population occurred after 1821, mainly driven by the northwestern regions, which were likely to be at the beginning of a phase of divergence. It is even interesting to note that Piedmont and Emilia Romagna, two regions longer hit by Napoleonic wars, experienced among the lowest growth rates. Only Lombardy, another region at the center of war scenarios, had comparatively higher growth rates signaling a resurgence of agricultural and industrial activities (Sella [2014]).

3.5 Discussion of results

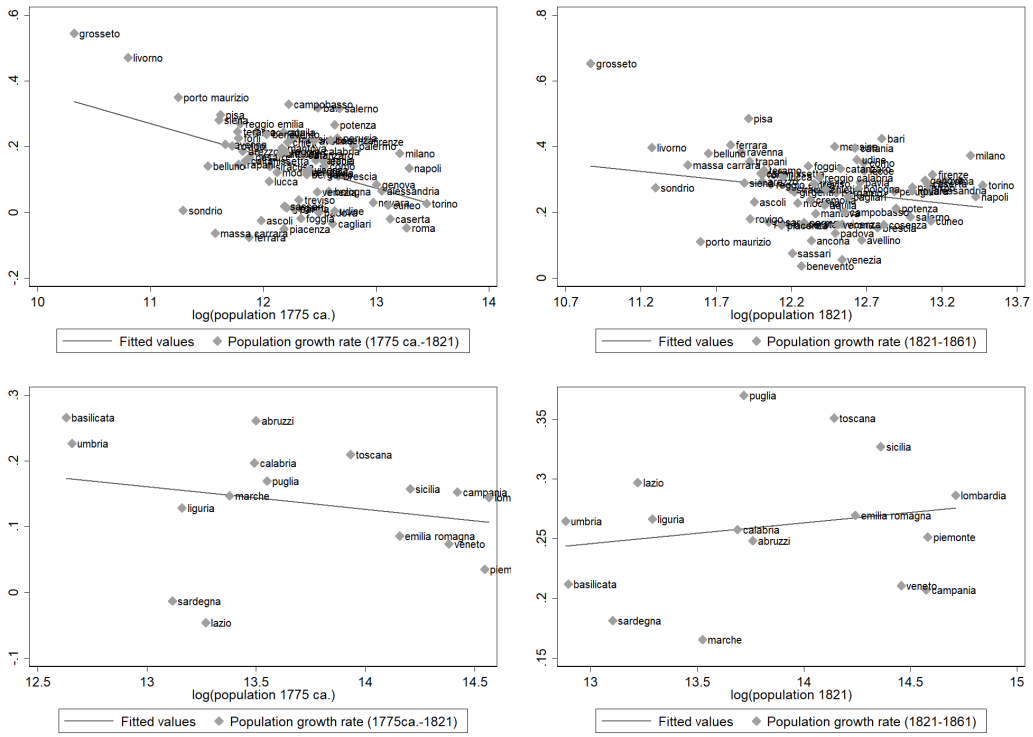
Population and economic development are strongly related. During the Middle Ages, a positive view prevailed: population was considered the real wealth of a country, and the source of its economic strength. Thereafter, D. Ricardo and R.T. Malthus (Malthus et al. [1992], Ricardo [1821]) proposed an alternative approach, which deemed negatively the relationship between population and economic activity. Specifically, population growth inevitably resulted in a decrease in productivity and resources per worker. A higher population density was also considered one of the main causes of the spread of epidemics and death the inevitable mechanism of readjustment of the balance between population and natural resources. The positive view regained success after the Second World War, with the seminal work by Boserup [2014]. In her view, the growth in population might induce innovation in technology, because of the attitude of people to become more industrious. In this context, population pressure forces individuals to intensively cultivate land and to exploit new rotation techniques. The intensification and innovation in agriculture are conducive to economic progress and a more efficient exploitation of resources. Hence, population growth and technical innovation in agriculture go hand in hand, ultimately resulting in better living standards for poor people. During the same years, also Kuznets [1967] investigated the relationship between population and economic growth. Although highlighting

Table 3.7: Population growth rate. Dependent variable: population growth rates at regional level.

	1775-1821	1775-1821	1821-1861	1821-1861
	(1)	(2)	(3)	(4)
log(pop1775)	-0.0343	-0.012		
	0.0332	0.0364		
log(pop1821)			0.0175	0.0298
			0.0192	0.0286
Constant	0.6062	0.2513	0.0181	-0.1558
	0.4674	0.5199	0.2648	0.3962
Macroregions	NO	YES	NO	YES
N	16	16	16	16
adj. R-sq	-0.008	0.048	-0.032	-0.342
F	1.067	6.144	0.837	0.413

Notes: OLS estimates. Robust standard errors are reported in parentheses. ***Significant at 1%; **significant at 5%; *significant at 1%. The value of the initial population is taken in 1778 for Tuscany, in 1782 for Marche and Sardinia, in 1788 for Parma and Piacenza and Liguria, and in 1774 for the remaining regions.

Figure 3.4: Scatterplots of unconditional convergence in population



Notes: Unconditional convergence in population at province-level [top-side (3.6, columns 1 and 4)] and regional level [bottom-side (Table 3.7, columns 1 and 3)] both in the two periods 1775-1821 [left-side] and 1821-1861 [right-side].

that the average growth rate of total product had been substantially higher than the corresponding population growth rates during the post-World War II in all western countries, he is more cautious in providing striking and conclusive results. He argued that without suitable economic, social and technical conditions, the underdeveloped countries, although registering the highest population growth rates and possessing a large potential for economic growth, are not allowed to divert modern technologies and their economic resources from current product into capital. After the studies of Esther Boserup and Simon Kuznets, the theory of economic growth has consolidated the so-called positive view of the economy-population relationship, with the recent revisions of the neoclassical theory through the endogenous growth models (Romer [1990]) and the more recent unified growth theory (Galor and Weil [2000], Galor [2011]). Population is now seen as an engine of technological progress and economic growth due to the increased diffusion of knowledge and the formation of human capital (Kremer [1993]).

If we assumed that population growth is a sign of economic development *per sè*, in line with the views of Boserup, we could infer that before 1821 the areas of central Tuscany and Milan were at the core of the comparative economic development of Italy. This interpretation overlaps the consolidated view that the two areas had some signs of rising industrialization (Sella [2014]) even before Unification. On the contrary, after 1821, the provinces with lower growth rates would suggest the existence of wide areas of relative underdevelopment until Unification. However, we would need more information to support this view. Population growth rates should be compared with other relevant economic variables, such as real wages, for designing a more informed scenario on the spatial distribution of progressive and underdeveloped areas. At the state of the art, the coverage of provincial distribution of real wages before unification is largely incomplete.

Another perspective is offered by the correlation between technological change in agriculture and population growth. Alfani [2010] documents the introduction of new advances in agrarian technology due to new crops and new rotation techniques, especially in the northern regions. The introduction of rice and maize cultivations for exports, used in crop rotations to eliminate fallow, constituted an important element of variety in agriculture. Moreover, it represented a new way of insurance against an excessive weather variability. This is due to the different reaction of each crop to severe meteorological conditions, rendering crop variety a fundamental insurance against the risk of a dearth from developing into a famine. Also institutional factors played a role, since the characteristics of provision authorities changed over the period considered in order to better balance the risks of bad weather. Capasso and Malanima [2012], following a similar argument, highlight the role of "land and labour intensifications" during the same period.

All these factors made possible to break the ceiling of about 6.5 million people in the North that had been insurmountable until the eighteenth century. The introduction of new agricultural innovations in the northern regions spread during the nineteenth century to other provinces,

ultimately generating surplus of food able to support a general rise in population.

3.6 Conclusions

The scarcity of solid statistical evidence before the unification hampers any informed analysis of Italy's long-term economic growth, especially for what concerns its provincial disparities. We contribute to fill this gap by providing the first ever population series at provincial level starting from 1770 ca. to Unification, which constitutes the essential statistical basis for future historical researches. We made use both of primary and secondary sources to get information on population figures at some benchmark years at the borders of 1871. Further, by employing a bottom-up approach, whenever possible, we collected data at municipal or district-level, and then we assembled those considering provincial borders in 1871, i.e. when the Unification process ended.

This contribution is not limited to a pure data record. Our data permit the identification of two different demographic regimes at provincial levels. The low regime, from 1780 to 1821, is characterized by low growth rates of population. The high regime is instead the one that began during the Restoration and lasted for the rest of the nineteenth century. Some areas escape the previous classifications. Large part of Tuscany and the area surrounding Milan showed a high demographic regime also during 1780-1821, while provinces in western Veneto, eastern Lombardy, Marche and Campania grew slower than Italian average during the high regime. Our findings about population dynamics should be compared to other notable evidence such as real wages, migration flows and human capital accumulation to assert whether population growth was correlated with root causes of economic development. Next researches can benefit from provincial population data for building more solid evidence of regional patterns of economic growth and for testing alternative theories.

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3.7 Appendix

3.7.1 Kingdom of the two Sicilies (continental part)

We account for changes occurred in 1816 and in 1861. Indeed, the administrative internal boundaries of the entire kingdom were reordered in 1816, as a result of the emanation of *Legge fondamentale del Regno delle Due Sicilie*, and in 1861, when the Kingdom was annexed to Italy, following the administrative reform of the *Rattazzi decree*, issued in 1859. As for the nineteenth century, we rely upon the work by Marzolla [1832], who reports municipal data in 1828 from the population census for the continental part of the Kingdom of the Two Sicilies. Figures for 1819 and 1840 related to preunitary provinces come from, respectively, Petroni [1826] and Napoli [1857]. We use the value referred to 1830 as a pivotal figure in order to reconstruct the population in 1819 and 1840. As a first step, we reassigned each municipality present in the 1828 Census to the province which it belonged in 1871. Then, we obtained the relative weights acounting for within province boundary changes occurred at Unification, and we applied them to the figures for 1819 and 1840. As for the eighteenth century, we rely on provincial data at pre-1816 borders coming from the work by Beloch et al. [1994], which seems to our knowledge the most recent and comprehensive work on the evolution of the italian population up to 1800. Even in this case, we employed the pivotal measure referred to 1828 Census.We briefly describe for each province the method through which we reconstructed its population time series. We mainly focus on the reconstruction of the benchmark years of the eighteenth century, as the procedure employed to obtain figures for 1819 and 1840 is the same for all the provinces.

Foggia

Data for the population of Capitanata, the former name of Foggia, are reported for 1765, 1788 and 1794 at the borders prior to the Bourbon reform. In 1788, the ancient province of Capitanata included some municipalities of Campobasso, the district of Larino, and some municipalities of the district of San Bartolomeo in Galdo, after Unification belonging to the province of Benevento, as well as two municipalities of the district of Ariano Irpino. Further, we are given with the figure for the population net of the district of Larino (see Beloch et al. [1994], pag. 165). We then use the data in 1828 to reconstruct the population of Capitanata in 1828 according to pre-1816 borders, and we compute the relative weights of the areas that no longer fall under Capitanata supervision after Unification (see also page 159 and pages 164-165). Lastly, we apply these weights to population values of 1765 and 1788.

Salerno

Data for the province of Salerno are taken following the same procedure. Values for the ancient province of Principato Citra are reported for 1765, 1775 and 1790 (see page 176) at the borders pre-1816 reform. Principato Citra included the whole unitary province of Salerno, the district of Castellammare di Stabia and the island of Capri, including some municipalities belonging to the unitary provinces of Avellino and Potenza. Thus, we employ municipal data coming from

the Population Census in 1828 to reconstruct the population of Principato Citra at pre-1816 borders. Then, we can compute the relative weight of the population of Salerno over the total population living in the "virtual" province of Principato Citra. Finally, we apply this proportion to values in 1765 and 1775.

Caserta

We applied the same procedure to construct the population of Caserta at unitary borders. First, we sum up in 1828 the population of municipalities belonging to the province of Caserta in 1861. Then, since we only have data for the population of the ancient territory of Terra di Lavoro in 1765 and 1788, we add the value of the population located in the territories belonged to Terra di Lavoro (except the province of Caserta, which is already included) to the 1830 estimate. Then, we obtain the relative weight of Caserta population over the total population living in Terra di Lavoro. Finally, we apply this weight to the values of the true figures of the province of Terra di Lavoro in 1765 and 1788[4].

Avellino

First, we utilized the pivotal figure of the Population Census in 1828 to construct the population of the province of Avellino. We summed up the number of inhabitants living in that municipalities belonging to the province in 1861. Then, we built up the population of the ancient province of *Principato Ultra* in 1828 as it was reported for 1790, and we computed the fraction of inhabitants living in the province of Avellino at unitary borders[5]. We applied the ensuing percentage to the true amount of the population living in Principato Ultra in 1790, and the resulting value was finally augmented by 18.93% in order to account for the number of inhabitants that Avellino gained at Unification. Such a weight takes into account the fraction of people living in the territories of *Capitanata, Principato Citra and Terra di Lavoro* before Unification, and then joining the province of Avellino in 1861. The value for 1765 was simply drawn by applying the percentage of Avellino population over the total number of inhabitants living in the Kingdom of the Two Sicilies in 1790.

Potenza

The population of the province of Potenza in 1828 was computed following the usual procedure. With respect to the other provinces, negligible changes occurred in 1816. Therefore, we did not

[4] In the period prior to the 1816 reform, the ancient province of *Terra di Lavoro* was composed by: the whole province of Caserta, except Pontecorvo, the province of Naples, without the city and its *Casali*, some municipalities of the district of Castellammare di Stabia belonging to *Principato Ultra*, several municipalities of the province of Campobasso, almost the entire district of Cerreto, in the province of Benevento, and some municipalities of Avellino.

[5] *Principato Ultra* corresponds to the provinces of Benevento and Avellino at unitary borders (see Beloch et al. [1994], pag. 156).

apply any correction to the values reported by Beloch [1959] for 1790 and by Beloch et al. [1994] for 1765[6].

Molise (Campobasso) and Benevento

We computed the population of Molise and Benevento in a residual way. We first compute the population in 1828 from the Census. We subtract the total sum of the population living in Benevento and Molise from the total population living in the Kingdom of the Two Sicilies. Then, we compute the fraction of inhabitants living in Benevento and Molise over their sum, and we apply these weights to the same residual difference in 1788. Finally, we add a forfeit number of 19000, including the inhabitants of the city of Benevento and its surroundings, previously belonging to the Papal State. The value for 1765 was simply drawn by computing the percentage of the population of Campobasso and Benevento over the total number of inhabitants living in the Kingdom of the Two Sicilies in 1790, and applying it to 1765[7].

Naples

As usual, we calculated the population of the province of Naples in 1828 taking municipal data coming from the Population Census in 1861. We exploit the level of territorial disaggregation to compute the fraction of inhabitants located in *Principato Citra* until the end of the eighteenth century (about 0.165%), which joined Naples at Unification. Finally, we apply this percentage to the values reported for 1765 and 1788 (sum of the inhabitants of *Napoli Città, Napoli Diocesi and Parrocchie Regie*).

Catanzaro and Reggio Calabria

We computed the population of Catanzaro and Reggio Calabria at unitary borders following municipal data coming from the Population Census in 1828. Further, we obtain the percentage of inhabitants living in the provinces of, respectively, Catanzaro and Reggio Calabria, and we apply them to the value of the population of *Calabria Ulteriore* in 1765 and 1788[8].

Cosenza

The population of the province of Potenza in 1828 was computed following the usual procedure. With respect to the other provinces, no changes occurred in 1816.

[6]Since it was more in line with subsequent values, we preferred the value of 361418 attributed by Beloch [1959] for 1788, rather than the value of 325992 assigned by Beloch et al. [1994].

[7]Indeed, Beloch et al. [1994] report a value referred to the whole province of *Calabria Ulteriore* (I and II), corresponding to the joint provinces of Catanzaro and Reggio Calabria after 1861.

[8]The population of Avellino, Molise and Benevento in 1765 is included in the figure provided by Beloch et al. [1994] referred to the ancient province of Montefusco, coinciding with the borders of *Principato Ultra*. Nevertheless, the value (286897) seems clearly underestimated. Hence, we opted for the aforementioned alternative method.

Chieti, Teramo and L'Aquila

We reconstruct the population of the provinces of Chieti, L'Aquila and Teramo in 1828 in the usual way. Further, since no internal changes occurred involving their boundaries, we do not apply any correction to data reported for 1765 and 1788.

3.7.2 Kingdom of the Two Sicilies (Sicily)

Data for all the provinces of Sicily come from Castiglioni [1862] and, specifically for 1830, from Marzolla [1832]. They are only available since 1816, after the constitution of the Kingdom of the Two Sicilies as a result of the Restoration. We have figures for 1816, 1819, 1830 and for every single year from 1836 up to Unification. Unfortunately, we cannot provide values for the provincial population before 1816, since Sicily did not undergo the same administrative partition. Indeed, it was divided in three provinces: *Val Demone, Val di Mazzara and Val di Noto*. Hence, it is impossible to reconstruct provincial population at unitary borders without having municipal data at our disposal. Nonetheless, we provide two reliable estimates drawn by Beloch et al. [1994] for 1748 and 1798, by assuming that the population was distributed within provinces according to the same proportions obtainable from the closest available benchmark year, namely 1816. Finally, we split the total population of Sicily among provinces by applying this weight. In such a way it is possible to get a reliable estimate even for the eighteenth century.

3.7.3 The Papal State

Provinces previously belonging to the Papal State underwent two different administrative reforms that substantially changed their internal borders. On the contrary, external borders, apart from negligible changes and relocations of a handful of municipalities, remained the same throughout the period under analysis. The two main changes refer to the issue of the *motu proprio* by Pio VII, occurred on the 6th of July 1816[9], which completely reordered the internal administrative borders of the State, and the Unification process, here taking place between 1861 and 1871. Data for the pre-1816 come from various sources, while data for the subsequent years- 1816, 1833, 1844 and 1853- come from Del Panta [1996], pag.40.

Rome (*Latium*)

Summing the population of the ancient provinces of Lazio, Sabina, Patrimonio and Campagna and Marittima, whose borders are laid out by Beloch et al. [1994], pag.216, and subtracting the population of the diocese of Rieti[10], it is possible to obtain the population of the province of Rome in 1769 and 1782 at unitary borders. Data are taken from Schiavoni and Sonnino [1980], pages 207-215. As for 1816, 1833, 1844 and 1853, we summed up the population of Roma, Comarca, Frosinone, Velletri, Civitavecchia and Viterbo.

[9] The complete name of the law is *"Quando per ammirabile disposizione della divina Provvidenza. Sull'organizzazione dell'amministrazione pubblica"*.

[10] The population of the diocese of Rieti for 1769 is obtained by linear interpolation between 1748 and 1782.

Perugia (*Umbria*)

The population of Perugia for two benchmark years at the end of the eighteenth century (1769 and 1782) comes from Beloch et al. [1994], who report data for the ancient administrative province of Umbria. We rely on the borders laid out at pag. 227 to provide a measure of the population of Perugia at unitary borders. By doing so, we sum up the population of the ancient territory of *Patrimonio d'Orvieto*, Gubbio, Costacciaro and Scheggia, and we deduct the population of Ascoli Arquata, Ancona Sassoferrato and Camerino Visso[11]. These data are provided by Corridore (1906) for 1782. Further, we compute the fraction of the population resulting from these territorial changes, and we apply it to 1769. As for 1816, 1833, 1844 and 1853, we sum up the population of Orvieto, Perugia, Rieti and Spoleto, coinciding with the province of Perugia in liberal age, less than Foligno and Nocera Umbra. Therefore, we calculate the fraction of the population belonging to these two municipalities in 1861, and we correct our estimate for its percentage.

3.7.4 Marche

We gather data for the provinces of Marche from Corridore [1906], who reports figures at municipal level in 1782, and measures referred to the ancient provinces and districts for 1816, 1833, 1844 and 1853. Pre-unitary territorial changes due to the issue of the motu proprio in 1816 are reported in Beloch et al. [1994], pag. 231, and in Corridore [1906], pag. 40.

Ascoli

The province of Ascoli in 1782 is reconstructed summing the population of the ancient territory of the *Presidio di Montalto*, the districts of Ascoli, Fermo and Arquata, the latter being part of Umbria in pre-unitary times. Then, we deducted the population of Gualdo, Mogliano, Petriolo, Sant'Angelo, at the time belonging to the province of Macerata. As for 1816, 1833, 1844 and 1853, we summed the values of the districts of Ascoli and Fermo, that we augmented for the percentage of Arquata, still in Umbria even in the post-1816 reform period.

Macerata

For the province of Macerata in 1782, we summed the population of the municipalities belonging to the ancient territories of the Governo di Macerata, Stato di Camerino, Luoghi Baronali and Governi Diversi. Then, we deducted the population of Castelfidardo, Corinaldo, Montealboddo, Filottrano, Montenuovo, Osimo, Serra dei Conti, Serra San Quirico, Staffolo, Rocca Contrada, Castelleone, San Donato and Ripalta, which moved to the province of Ancona at Unification. Further, we added the population of Visso, at the time in Umbria, and Gualdo and Mogliano, at the time in Ascoli. As for 1816, 1833, 1844 and 1853, we summed the values of the districts of Mac- erata and Camerino, plus some municipalities[12]. Therefore, we computed the fraction

[11] Notice that these corrections will also be applied to the provinces of origin.

[12] These municipalities correspond to: Fabriano, Loreto, Sassoferrato, Filottrano, Serra San Quirico, and San Donato.

of inhabitants living in these municipalities in 1782, and we adjusted the population value in subsequent years for such a proportion.

Ancona

As for the province of Ancona in 1782, we summed the population of the municipalities belonging to the Governo di Ancona, Governo di Jesi, Governo di Macerata, Luoghi Baronali, Duchy of Urbino, Governo di Fano, and province of Feltria. Moreover, we added the population of Sassoferrato, at the time in Umbria. As for 1816, 1833, 1844 and 1853, we summed the values of the district of Ancona, less than Cerreto, Fabriano, Filottrano, Genga, Loreto, Monsano, Ostra, Ostra Vetere, Santa Maria Nuova, Sassoferrato, Senigallia, and Serra San Quirico. Therefore, as well as the province of Macerata, we applied the proportion of the population living in these municipalities in 1782 to the figures for the subsequent years, in order to correct the original value.

Pesaro-Urbino

For the province of Pesaro-urbino in 1782, we summed the population of municipalities belonging to the Duchy of Urbino, Governo di Fano, province of Feltria, Luoghi Baronali and the province of Massatrabaria. We subtracted the population of Ripalta, Tomba, Monterado, Ripe, and Senigallia, that are added to Ancona, the population of Gubbio, Costacciaro, Civitella Ranieri, Coccorano and Scheggia, moving to the province of Perugia, and the population of Massanente, Montepetra, Rontagano and Savignano di Rigo, which moved to the province of Forlì. As for 1816, 1833, 1844 and 1853, we summed the values of the province of the same name, plus some municipalities moving elsewhere at Unification. These are: Gubbio, Costacciaro, Pacilupo, Scheggia, Senigallia, Tomba, Monterado and Ripe. Therefore, as before, we corrected the figures for the subsequent benchmark years by applying the proportion of the population living in these municipalities in 1782.

3.7.5 Romagna

Bologna

We report figures for the population of the *Stato di Bologna* in 1769 and 1782 from Beloch et al. (1994). Since the figure does not count the population corresponding to the unitary district of Imola, we add its population in order to obtain the total population of the province of Bologna at unitary boundaries[13]. An estimate for the territory of Imola is available for 1769 and 1783 (Beloch et al. [1994], pag. 259). As for 1816, 1833, 1844 and 1853, figures are referred to the whole province, except the municipalities of Bentivoglio, Castello d'Argile, Castello di Serravalle, Castenaso, Sant'Agata, Castel del Rio, Dozza, Fontana Elice, Mordano and Bagni

[13]Some changes occur during the pre-unitary period, but they involve only few municipalities. Hence, we can neglect them.

della Porretta. Therefore, we compute the percentage of the corresponding population in 1861 over the total population of the province of Bologna, and we add it.

Ferrara

Beloch et al. [1994] and Beloch et al. [1994] report data referred to the ancient province of Ferrara for 1769 and 1782. We compare the municipalities within the ancient province in 1769 and the ones in the liberal province in 1861, and then we subtract the population belonging to the district of Lugo, by summing up the population of the dioceses of Imola in the *legation of Ferrara (terra di Lugo, territory of Lugo, vicariate of Barbiano, territory of Cottignola, Massa Lombarda* and its countryside), as well as the population of the *vicariate of Bagnocavallo, vicariate of Cottignola, vicariate of Fusignano, vicariate of Sant'Agata, vicariate of Sant'Andrea and vicariate of San Pietro in Lacuna*. We apply the same percentage of these territories to the value in 1782, and we get the proper value for this benchmark year. As for 1816, 1833, 1844 and 1853, we take the values for the province of the same name, including the district of Lugo. Hence, we subtract our estimate for the district of Lugo, coming from the linear interpolation of the corresponding value in 1769 and the value we find in Population Census in 1861[14].

Ravenna

As for 1816, 1833, 1844 and 1853, we take the values related to the province of the same name, less than the district of Lugo and including the district of Imola. We use the same estimates of the territory of Lugo we obtained for the province of Ferrara and we sum them up to the value of Ravenna population. Afterwards, we get an estimate of the district of Imola, by dividing the corresponding population of the *circondario* in 1861 over the total population of the province of Ravenna. Then, we apply this percentage to the figures of 1816, 1833, 1844 and 1853. Furthermore, we divide the resulting population of Ravenna by the total population of *delegazione di Romagna*. Since we have at our disposal this information for 1769 and 1782, we finally apply this percentage to the figures referred to these two years.

Forlì

We report estimates for the province of Forlì in 1816, 1833, 1844 and 1853 by Corridore [1906]. Then, we divide this figure by the total population of the *delegazione di Romagna*, and we apply the resulting percentage on the measures provided by Beloch et al. [1994] for Romagna in 1769 and 1782.

3.7.6 Granduchy of Tuscany (Tuscany) and Duchy of Lucca

As for the Granduchy of Tuscany and the Duchy of Lucca, we utilized two sources of data: Bandettini [1957] and Beloch et al. [1994]. In the first source, we find yearly data at municipal level from 1810 until 1861 at 1950 borders. We exploit the detailed level of territorial disaggregation

[14] Our estimate approximates the figure provided by Castiglioni [1862].

to construct provincial population at borders in liberal age[15]. For the sake of exposition, we decided to report data only for five benchmark years: 1810, 1820, 1830, 1840 and 1850. In the second source, we get estimates for some benchmark years in the end of the eighteenth century. We adjust these measures according to data for each ancient diocese on a case-by-case scale.

Arezzo

We get estimates for 1765, 1784 and 1794 by summing up the total population of the dioceses of Arezzo, Sansepolcro, Sestino, Montefeltro and Cortona[16]. Data for 1810, 1829, 1830, 1840 and 1850 are adjusted for the corresponding fraction of the population of Santa Maria Tiberina, later on moving to the province of Perugia.

Florence

We get estimates for 1765, 1784 and 1794 by summing up the total population of the dioceses of Florence, Fiesole and San Miniato, plus 75% of the population of the dioceses of Pistoia and Prato[17]. The population of the province of Florence for the subsequent years is computed as follows: we sum up the total population of the province at 1950 borders, we add the population of Castelfranco di Sotto, Montopoli in Valdarno, San Miniato, Santa Croce sull'Arno, Santa Maria Monte, being part of the province of Pisa in 1950, and the part of the circondario of Pistoia without the municipalities converging to the province of Lucca at Unification[18]. Finally, we apply the percentage corresponding to the total population of the district of Rocca San Casciano in 1861, as it was part of the *delegazione di Romagna* before Unification.

Grosseto

We get estimates for 1765, 1784 and 1794 by summing up the total population of the dioceses of Massa and Maremma Senese, including Grosseto, Sovana and Acquapendente, and the population of the *Stato dei Presidi*[19]. The figures for the subsequent years have not been corrected, because the province of Grosseto did not undergo any change in the boundaries between Unification and 1950.

[15] As usual, we look at the municipalities within tuscan provinces in the Population Census of 1861.

[16] Data for Sestino are not available for 1784 and 1794 and data for Montefeltro are not available for 1794. Therefore, the population of the province of Arezzo should be slightly underestimated.

[17] The province of Pistoia was constituted in 1927 with some municipalities previously belonging to the provinces of Florence and Lucca. According to Bandettini [1957] 66% of the total population of Pistoia converges to the province of Firenze. Here, we arbitrarily apply a greater percentage (75%) to account for the presence of Prato, that was likely to concentrate the vast majority of the population in the diocese.

[18] These municipalities correspond to: Buggiano, Ponte Buggianese, Massa e Cozzile, Monsummano Terme, Montecatini Terme, Pescia, Pieve a Nievole, and Uzzano.

[19] The population of the Stato dei Presidi is only available for 1794. Nonetheless, the remaining figures have not been adjusted for the corresponding portion of the population, since it counted only a small part of the total population. Hence, when not counted, the population of the province of Grosseto might be slightly underestimated.

Siena

We get estimates for 1765, 1784 and 1794 by summing up the total population of the dioceses of Montepulciano, Siena and Colle. As for Grosseto, the figures for the subsequent years have not been corrected, because the province of Siena did not undergo any change in boundaries between Unification and 1950.

Pisa

The population of the province of Pisa in 1765, 1784 and 1794 comes from the sum of the population of the diocese of the same name and the population of the *Principato di Piombino*. Data for the subsequent years are obtained correcting the population referred to the province of Pisa at 1950 boundaries. We added the population of some municipalities belonging to the province of Livorno in 1950[20], and we subtracted the population of the municipalities belonging to the province of Florence at Unification: Castelfranco di Sotto, Montopoli in Valdarno, San Miniato, Santa Croce sull'Arno and Santa Maria Monte.

Lucca

The population of the province of Lucca was reconstructed for two benchmark years 1744/1751 and 1758/1765, by summing up the population of the dioceses of Pescia, 25% of the *circondario* of Pistoia, and the amount of the population belonging to ten municipalities that were part of the ancient *Republic of Lucca*, and that constituted the majority of the State (about 90%)[21][22]. Data for the subsequent years are obtained as follows: we subtracted the population of some municipalities that were included in the province of Massa-Carrara in 1861[23] from the figure referred to boundaries in 1950, and we added the population of the municipalities that in 1927 converged to the province of Pistoia[24].

Massa-Carrara

Two estimates for the population of the province of Massa- Carrara around 1750 and 1800 are provided (see Beloch et al. [1994], pages 340-341, taking into account the territories previously belonging to Pontremoli, Lucca, *Stato Fiorentino*, Modena, and feudal domains, that were part of the province of Massa-Carrara after Unification. For the subsequent years, we added the

[20] These municipalities correspond to: Bibbona, Campiglia Marittima, Castagneto Carducci, Cecina, Collesalvetti, Piombino, Rosignano Marittimo, Sassetta, and Suvereto.

[21] These municipalities correspond to: Bagni di Lucca, Borgo a Mozzano, Camaiore, Capannori, Coreglia Antelminelli, Lucca, Massarosa, Pescaglia, Viareggio, Villa Basilica. For further details on the population and boundaries of the ancient *Republic of Lucca*, see Beloch et al. [1994], pag. 334.

[22] We believed it was inappropriate to include the population of the diocese of Lucca, due to clear overlapping with the inhabitants of the *Republic of Lucca* and the city of Lucca.

[23] These municipalities correspond to: Camporgiano, Careggine, Castelnuovo di Garfagnana, Castiglione di Garfagnana, Fabbriche di Vallico, Fosciandora, Gallicano, Giuncugnano, Minucciano, Molazzana, Piazza al Serchio, Pieve Fosciana, San Romano in Garfagnana, Sillano, Vagli Sotto, Vergemoli and Villa Colemandina, and coincide with the *circondario* of Castelnuovo di Garfagnana.

[24] See note 18.

population of the municipalities deducted by the province of Lucca[25], and we corrected the resulting value for the proportion of inhabitants of Calice al Cornoviglio and Rocchetta di Vara, later on moving to the province of La Spezia.

Livorno

The population of the province of Livorno at unitary borders for the end of the eighteenth century is obtained by summing the population of the city of Livorno and the inhabitants of Elba island in 1778 and 1790[26]. For the subsequent years, we summed up the population of the municipalities included in the province of Livorno after Unification[27].

3.7.7 Duchy of Modena and Reggio Emilia

In 1741, the Duchy included the territories matching the current provinces of Modena and Reggio Emilia. Further, it included some areas of the historical provinces of *Lunigiana* and *Garfagnana*, as well as the *Principati* of Massa and Carrara. In 1844, the Duchy of Guastalla was acquired from the Duchy of Parma and Piacenza. In order to get the size of the population of Modena and Reggio Emilia at the boundaries of 1871, we need to subtract the population of *Lunigiana*, *Garfagnana*, Massa, Carrara, Villafranca, and Mulazzo, that belonged to the Duchy until 1844, and then add the population belonging to the Duchy of Guastalla.

Modena and Reggio Emilia

As for the eighteenth century, Beloch et al. [1994], pages 371-372 provides detailed figures for the districts of the Duchy in 1770, 1775 and 1794. As to Guastalla, a figure for 1814 is reported, that we linearly interpolate with the value of the population provided for 1861 in the Population Census. As for 1850, we use data coming from Sabbatini [1854]), disaggregated for the ancient provinces within the Duchy. The population of the province of Modena at unitary borders is obtained summing the amount of population of Frignano and Modena, while we leave aside the inhabitants of the territories of *Lunigiana*, *Garfagnana* and Massa and Carrara. The population of the territory of Guastalla is already included in Reggio Emilia. Finally, we compute the weight representing the percentage of the population in 1850 of the two provinces in the whole Duchy, and we apply it to the figure for the total number of inhabitants in 1803, provided by Beloch [1888], pag. 491.

3.7.8 Duchy of Parma and Piacenza

The area of the Duchy had not changed significantly since its constitution in 1545. In the 18th century, the provinces of Piacenza and Parma, at the boundaries of 1871, coincided with the

[25] See note 23.

[26] The population of Elba island is obtained by a linear interpolation between the values reported for 1740 and 1806 (see Beloch et al. [1994], pag. 300.

[27] These municipalities correspond to: Capoliveri, Livorno, Marciana, Marciana Marina, Porto Azzurro, Portoferraio, Rio Marina and Rio nell'Elba.

Duchy but Guastalla. Indeed, Guastalla was ceaded in 1844 to Modena in exchange of Villafranca and Mulazzo from Modena and Pontremoli, and Bagnone and Filattiera from Tuscany. Since 1833 until Unification, data on the total population of the Duchy are collected by Podesta' [2011], pag. 44. Figures include all the changes in the territory that occurred in that period. Hence, we should substract the population belonging to the territory of Guastalla (Guastalla, Luzzara, Reggiolo) until 1844, and the population included in the territory of Pontremoli after 1844. By doing so, we can get the total population of the provinces of Parma and Piacenza as they were shaped after Unification.

Parma and Piacenza

We gather data for the population of the territory of Guastalla in 1814 by Beloch et al. [1994] and Buttafuoco [1854], whose guess is that its population had not changed since 1787. Moreover, we collect detailed data at municipal level in 1814, 1820, 1839-1845 by Buttafuoco [1854]. Therefore, we can obtain figures for the provinces of Parma and Piacenza using borders at 1871. On the one hand, the province of Parma at 1871 borders includes the district of Borgotaro (former Valtarese), except the municipalities of Bardi and Boccolo, which belonged to Piacenza before Unification. On the other hand, Piacenza acquired the Dioceses of Fiorenzuola and Cortemaggiore from Parma. Beloch et al. [1994], pages 343-357 provides us with the population of the territories of Fiorenzuola and Cortemaggiore in 1787 and the population of Borgotaro in 1814. Further, the authors assume that the population had neither increased nor decreased between 1787 and 1814. Hence, by employing the values reported in Beloch et al. [1994], we make the same assumption and we estimate the population of the provinces of Parma and Piacenza in 1787.

3.7.9 Kingdom of Sardinia

Genova and Porto-Maurizio

We used data coming from preunitary censuses (Regia Commissione Superiore [1839]) for 1819, 1824, 1830, 1838 and 1850, reported in Castiglioni [1862] We summed up the amount of the population of the districts of Genova, Albenga, Chiavari, Levante and Savona to reconstruct the population of the province of Genova, while we summed up the population of Oneglia and Sanremo to get the inhabitants of the province of Porto-Maurizio. As for the eighteenth century, we collect data at electoral district level in 1797 from Castiglioni [1862]. Specifically, the estimate for the province of Porto-Maurizio is given by the total amount of the population of the historical territories of *Capo Verde* and *Delle Palme*, with district capitals, respectively, Diano and Sanremo. Then, we use Beloch et al. [1994], who reports values for the total amount of the population of Liguria, from which we deduct the population of the territories of *Monti Liguri Occidentali* and *Novi, Gavi and Ovada.* The difference between the resulting amount and

the population assigned to the province of Porto-Maurizio returns the estimate for the province of Genova in 1797[28].

Turin

The population of the province of Turin is taken from the same sources for the same years. As for the nineteenth century, it has been reconstructed summing the inhabitants residing in the districts of Turin, Ivrea, Pinerolo, Susa and Aosta[29]. As for the eighteenth century, we report population figures referred to the same ancient districts for 1774.

Alessandria

The population of the province of Alessandria is taken from the same sources, and it amounts to the inhabitants located in the districts of Alessandria, Acqui, Asti, Casale, Tortona and Novi. The population of the districts of Novi is not available for 1774. Hence, we decided to apply to the total population of the province of Alessandria the relative weight of the district of Novi, computed at 1819 values.

Novara

As before, we take data from the same sources. We sum up the population in the districts of Biella, Novara, Pallanza and Vercelli.

Cuneo

As before, we take data from the same sources. We sum up the population in the districts of Cuneo, Alba, Mondovì and Saluzzo.

Cagliari

The population of the province of Cagliari in the nineteenth century at unitary borders comes from the pre-unitary Censuses held in 1819, 1839, 1844-45 and 1848. It amounts to the inhabitants of the districts of Cagliari, Iglesias, Busachi, Isili, Lanusei, and Cuglieri. As for the eighteenth century, we took the value for the whole Sardinia in 1782, coming from Beloch et al. [1994], and we attributed to the province of Cagliari the percentage of its population over the total population of Sardinia in 1819, the closest year for which we observe the population.

[28] Alternatively, we could have used estimates from Felloni [1961a], who provides population values for the provinces of Genova, Savona, Imperia and La Spezia at 1950 borders for some benchmark years in the nineteenth century. We observe mild differences with respect to his estimates. More specifically, our estimates for the population of the province of Genova at unitary borders seem to be slightly smaller than the figures assigned by Felloni [1961a], whereas only negligible disparities occur with respect to the population of the province of Porto-Maurizio. This implies that we find, in comparison, a higher population growth rate for Genova throughout the nineteenth century up to 1861.

[29] The same figures can be collected from Castiglioni [1862].

Sassari

The population of the province of Sassari in the nineteenth century at unitary borders comes from the same sources employed for Cagliari. It amounts to the population of the districts of Sassari, Nuoro, Alghero, Ozieri and Gallura. As for the eighteenth century, we attributed the complement to one of the fraction of the population belonging to the province of Cagliari in 1819.

3.7.10 Lombard-Venetian kingdom: Lombardy

Data for the provinces of Lombardy in the nineteenth century come from pre-unitary Censuses, that are completely reported in Castiglioni [1862]. We have thorough in- formation of the provincial population in 1805, and yearly from 1813-1814 until 1859. Nevertheless, for the sake of exposition, we decided to report figures only for some benchmark years: 1805, 1813-14, 1820-21, 1830-31, 1840-41, and 1850-51. The values reported for 1805 (Napoleonic Census) seem too high compared to the values of the subsequent years. Nonetheless, we use it because it represents the unique source in which data at district-level are shown. Such a territorial disaggregation allows us to correct the estimates for boundary changes occurred after Unification, by comparing the internal borders of the ancient provinces of the Lombard-Venetian Kingdom with the corresponding borders after Unification. For the late eighteenth century, we made several corrections to population values coming from Beloch et al. [1994], in order to account for several territorial changes occurred throughout the period under analysis.

Milan

The population of the province of Milan at 1871 borders comes from the total amount of the population of the districts of Milano, Gallarate, Monza and Lodi, and in the *Cantoni* of Abbiategrasso, Binasco and Gaggiano in 1805. As for the subsequent years, since only the population of the Austrian province of Milan is reported, we correct the estimates by augmenting the population for the portion of the inhabitants located outside these borders, namely the district of Lodi and the *Cantoni* belonging to the Austrian province of Pavia. For 1771, since only data referred to partial territory of the ancient *Stato di Milano* are reported, we make use of the disaggregated values contained in the Napoleonic Census to reconstruct the corresponding population in 1805 (except the district of Lodi). Hence, we can obtain the percentage of the population of the province of Milan over the total population located in the ancient state (about 63%) in the same year. Then, we apply this percentage on the total amount of the inhabitants of the city of Milan and the territory between Ticino and Adda rivers[30] in 1771. Finally, the resulting amount has been added to the population located within the district of Lodi, equal to the corresponding

[30]This territory should coincide with the areas of: districts of Lecco, Varese, Menaggio, Monza, Gallarate, Milano, *Cantoni* of Abbiategrasso, Binasco, Gaggiano, and Treviglio (Ghiara d'Adda), and some other municipalities previously belonging to the territories of Crema, Casale and Pavia (see Beloch et al. [1994], pag. 524) in 1805. We assigned arbitrary values to count the population of these last municipalities, (respectively, 9000, 2500 and 5000 inhab.).

unitary *circondario*, but Fombio, Guardamiglio and San Rocco, at that time part of the Duchy of Parma and Piacenza. A forfeit number of 3500 inhabitants has been assigned to these three municipalities, and it has been added to the total amount of the population of the province of Milan at 1871 borders.

Pavia

The population of the province of Pavia has been reconstructed as follows: we collected the population of the Austrian province of Pavia, we deducted the population of the *Cantoni* that moved to Milan at Unification, we added the amount of population belonging to Voghera, Bobbio and some municipalities at the time in the province of Alessandria[31]. As for the subsequent years, we corrected the figures reported for the ancient province of Pavia, accounting for these changes. For 1771, we summed up the population of the territories east of Ticino river, *Lomellina, Bobbio, Oltrepò and Siccomario, and Vigevano* and its territory. In addition, we added the population located in the ancient Stato di Milano, within an area of 90 sq. km. The same population density of 108 inhab. per kmq has been applied to this area to compute the corresponding population.

Mantua

The Austrian province of Mantua was slightly bigger than the same province after Unification, due to the transfer of some municipalities to adjacent provinces. Nonetheless, these territorial changes were negligible, and we did not produce any correction to the values reported. We have available information on the population of the city and its territory in 1770 from Beloch et al. [1994], pag. 490. Nonetheless, we applied some corrections to account for changes in boundaries: the population of Ostiano and Volongo, then moving to the province of Cremona, has been deducted (forfeit number of 2000 inhabitants), the population of Asola and Casaloldo has been added (the former with 3644 inhab. in 1730, and the latter associated to a forfeit number of 350 inhab.), as well as the inhabitants of Monzambano and Ponti del Mincio, at that time in Verona (arbitrary estimate of 4000 inhab.).

Brescia

The borders of the Austrian province of Brescia coincided with the borders of the unitary province, apart from the district of Breno, belonging to Bergamo at that time. Hence, we add the corresponding population for 1805, and we correct the values for the subsequent years with the respective weight. For 1771, we sum the population of Brescia and its territory and Salò from Beloch et al. [1994]. Then, following the indications on the boundaries at pag. 481, we

[31] Figures for the territories of *Voghera* and *Lomellina* are gathered from the pre-unitary Censuses of the Kingdom of Sardinia (linear interpolation between 1774 and 1850, keeping figures for benchmark years at ten-year intervals). We assigned a forfeit estimate of 5000 inhabitants for the population of municipalities previously belonged to Alessandria.

subtracted the population of Asola and Casaloldo (3644 inhab., and a forfeit number of 350 inhab. in 1730)[32]

Bergamo

The population of the Austrian province of Bergamo included the inhabitants of the district of Breno. Hence, we subtracted the corresponding population in 1805 and we corrected the values for the subsequent years with the respective weight. For 1771, we summed up the total population of the territory of Bergamo reported in Beloch et al. [1994], pag. 491 and the population of the territories belonging to the provinces of Brescia, Milan and Cremona that joined the province of Bergamo at a later time. These are: *Luoghi separati dal territorio (Val di Scalve, di Averara Taleggio, Torta)*, at that time in Milan, and the parts of the district of Treviglio divided between the provinces of Milan (*Ghiara d'Adda*) and Cremona. Unfortunately, only one value for *Ghiara d'Adda* in 1730 is given. Since we do not have available data for these two regions in 1774, we desumed their population by imputing to the population of *Ghiara d'Adda* in 1730 an average population growth rate of the adjacent territories (the territory of Milan between Ticino and Adda rivers, Lago Maggiore, Ossola and Antigorio, Milan), namely 30%. Then, since we have information on the extension of its territory, we compute its population density, and we assume that it is the same among the territories of the district of Treviglio at that time in Cremona. Then, we multiply it for their squared km., and we get an estimate for this territory too. Further, we assume an arbitrary number of one thousand inhabitants proxying the inhabitants of Costa Volpino and Rogno, belonging to Brescia. Finally, we sum all these values and we obtain the population of the province of Bergamo in 1771 at 1871 borders.

Cremona

The population of the province of Cremona in 1805 is drawn from the sum of the inhabitants located in the districts of Cremona, Crema, and Casalmaggiore. In the subsequent years, the district of Crema is not included within provincial borders. Thus, we computed the relative weight and we applied it to the values reported in the Population Censuses. For 1771, we summed the population of Cremona and its territory, the territory of Casalmaggiore, the population of Crema and its territory, and the inhabitants of Ostiano and Volongo, belonging to the province of Mantua (forfeit number of 2000 inhabitants). Finally, we subtracted the part of the district of Treviglio included within the province of Bergamo after Unification, computed as described for the province of Bergamo.

Como

The population of the province of Como in 1805 has been reconstructed by summing the population of the districts of Como, Varese, Lecco, and Menaggio, corresponding to the province of Como after Unification. No administrative changes arose later. Thus, we report censuses values

[32] The population of Sirmione, at that time in the territory of Verona, and Costa Volpino and Rogno, that moved to the province of Bergamo, compensate each other.

without any correction. For 1771, as for the province of Milan, we computed the percentage of the territories corresponding to the province of Como at 1871 borders over the total population of the ancient *Stato di Milano* in 1805. These territories coincide with the districts of Varese, Lecco, Como and Menaggio. Since an estimate of the city of Como and its territory is available, we only put together the inhabitants of the remaining districts, and we finally calculate the corresponding percentage (around 30%). Then, we apply this weight to the total amount of the inhabitants of the city of Milan and the territory between Ticino and Adda rivers[33], and we add the value for the city of Como and its territory.

Sondrio

The Austrian province of Valtellina, with Sondrio as provincial capital, remained unchanged after Unification. Then, we report the corresponding values for all benchmark years in the nineteenth century. For 1771, since Sondrio and the corresponding district of Valtellina were under the jurisdiction of the Grisons, we found no available population data. Hence, we assign an arbitrary value of 80000 inhabitants, slightly smaller than the figure reported for 1805.

3.7.11 Lombard-Venetian kingdom: Veneto

Data for the provinces of Veneto in the nineteenth century come from Castiglioni [1862] and Stefani [1854], who reports values drawn from pre-unitary Censuses in 1823, 1843 and 1852[34]. Moreover, the 1843 Population Census reports figures at a very detailed level of territorial disaggregation. This allows us to reconstruct the level of the population for all the provinces at unitary borders, as a result of several territorial changes occurred at the time of the annexation of Venetian provinces in 1866 and during the preceding years[35]. As for 1766, we collect figures provided by Beloch et al. [1994], and we correct them for some adjustment to account for changes in boundaries occurred during the Restoration.

Venezia

The population of the province of Venezia at unitary borders has been reconstructed by summing the inhabitants in the districts of Venezia, Mestre, Dolo, Chioggia, San Donà, Portogruaro, Mirano and Noale in 1843. As for the remaining years, we computed the relative fraction of the population belonging to the districts that changed province, and we applied them to the value of the population of the Austrian province[36]. The estimate referred to 1766 has been

[33] See note 30.

[34] We decided not to report estimates for the Napoleonic Census in 1807, contained in Castiglioni [1862], because the resulting figures appear not reliable, insofar they unplausibly overestimate population values for all the considered provinces.

[35] See Zuccagni-Orlandini [1861] for all the details concerning territorial changes occurred within Venetian provinces during the nineteenth century (from 1815 until 1866).

[36] In 1838, the Austrian province of Venezia acquired the district of Portogruaro, in 1851 ceaded the districts of Loreo and Ariano to the province of Rovigo, and in 1853 acquired the district of Mirano, with Noale, from the province of Padua.

reconstructed by summing the population of Venezia plus its territory[37], the population of the *Dogado*, including Chioggia, Gambarare, Caorle, Grado and some other small municipalities, and the population of some municipalities moving from the province of Treviso, such as Mestre, Cesana, San Polo, San Donà and Noal.

Belluno

The province of Belluno did not undergo any administrative change during the preunitary period. Hence, we reported the figures provided for its population province for all benchmark years without any correction. In 1766, the value of its population comes from the total amount of the inhabitants of the districts of Belluno, Feltre and Cadore.

Padua

The population of the province of Padua at unitary borders has been reconstructed by summing the inhabitants living in the districts of Padua, Camposampiero, Piazzola, Teolo, Battaglia, Montagnana, Este, Monselice, Conselve, Piove, and Cittadella in 1843. As for the remaining years, we computed the relative fraction of the population belonging to the districts that changed province, and we applied them to the value of the population of the Austrian province[38]. The estimate referred to 1766 includes the district of Mirano and Dolo, as well as some municipalities part of the district of Cittadella, west of the Brenta river. Hence, the population of the province of Padua has been reconstructed by summing the population of Padua with its territory, and then deducting the relative weight of the district of Mirano in 1843. Finally, we subtracted a forfeit value of 2000 inhabitants proxying the population of the municipalities west of the Brenta river.

Vicenza

The population of the province of Vicenza has been reconstructed deducting the amount of inhabitants belonging to the district of Cittadella from the total amount of the Austrian province[39], including the districts of Bassano, Marostica, Asiago, Tiene, Schio, Malo, Valdagno, Arzignano, Lonigo and Barbarano. As for 1766, we summed the population of Vicenza and its territory, the forfeit value of 2000 inhabitants proxying the population of the municipalities west of the Brenta river, and the population of the district of Bassano.

[37] We only have a value for the territory of Venezia in 1857. We employed it to compute the relative fraction over the population of the city, and we applied the same percentage in 1766.

[38] The province of Padua ceaded the districts of Cittadella in exchange for Noale to the province of Venezia in 1818. Then, in 1853, Noale was incorporated in the district of Mirano and it moved to Venezia, once again in exchange for Cittadella.

[39] In 1818, the province of Vicenza ceaded Noale to the province of Padua, in exchange for Cittadella. In 1853, Noale was incorporated in the district of Mirano and it moved to Venezia, and the province of Vicenza ceaded Cittadella to the province of Padua.

Rovigo

The population of the province of Rovigo has been reconstructed summing the inhabitants of the Austrian province of Rovigo, including the districts of Rovigo, Adria, Lendinara, Badia, Massa, Occhiobello, Crespino and Polesella, and the inhabitants of the districts of Loreo and Ariano, assigned to the province in 1851. In 1766, following the indications provided by Beloch et al. [1994], pag. 442, we computed the population of the province of Rovigo as follows: we summed up the population of Rovigo and its territory, the districts of Lendinara and Badia, and the municipalities of Ariano, Crespino, Trecenta, and Ficarolo. Finally, we applied the fraction of the population belonging to the districts of Loreo and Ariano, calculated for 1843, to adjust for the respective population.

Verona

The province of Verona, like the province of Belluno, did not undergo any administrative change during the pre-unitary period. Hence, we report the figures provided for all benchmark years in the nineteenth century without any correction. In 1766, the value of its population comes from the total amount of the inhabitants of Verona and its territory, plus Cologna, at that time independent[40].

Udine

The population of the province of Austrian Udine includes the same territories of the province of Udine after Unification, except the district of Portogruaro, that was ceaded to the province of Venezia in 1838. Thus, we compute the weight of its population over the total population of the province of Udine, and we deduct it in 1823. As for 1766, we sum up the population belonging to Sacile, Pordenone and its territory, *Friaul*, Carnia, Cividale, Palma and Marano. Finally, we deduct the same percentage referred to Portogruaro, as did for 1823[41].

Treviso

The province of Treviso, as Belluno and Verona, did not undergo any administrative change during the pre-unitary period, and precisely from 1815 until 1861. Therefore, we report the values contained in the pre-unitary Censuses for all the available benchmark years. As for 1766, we sum up the population of Treviso and its territory, Conegliano and its territory, and Ceneda, while we deduct the inhabitants of the districts of Mestre, Cesana, San Polo and San Donà, Mel, and Noal, moving to the province of Venezia.

[40] The ancient province of Verona included also Sirmione, Monzambano, Ponti del Mincio and Gambellara. Nevertheless, we did not make any correction to adjust for their inclusion, as the corresponding population is negligible.

[41] Beloch et al. [1994] argue that the population belonging to some Austrian enclave (Codroipo and others), part of the province of Udine after 1861, and the territory of Monfalcone along the coast, compensate each other.

As already mentioned, we interpolate data between the two closest available benchmark years, and we reconstruct the population time series for each province from the first available value up to 1861. Data for selected benchmark-years are reported in Table 3.8 in the Appendix B. Further, we report in figure 3.5, Appendix B, the graph for the population trends for all the 69 italian provinces.

3.8 Appendix

Table 3.8: Provincial population in some years

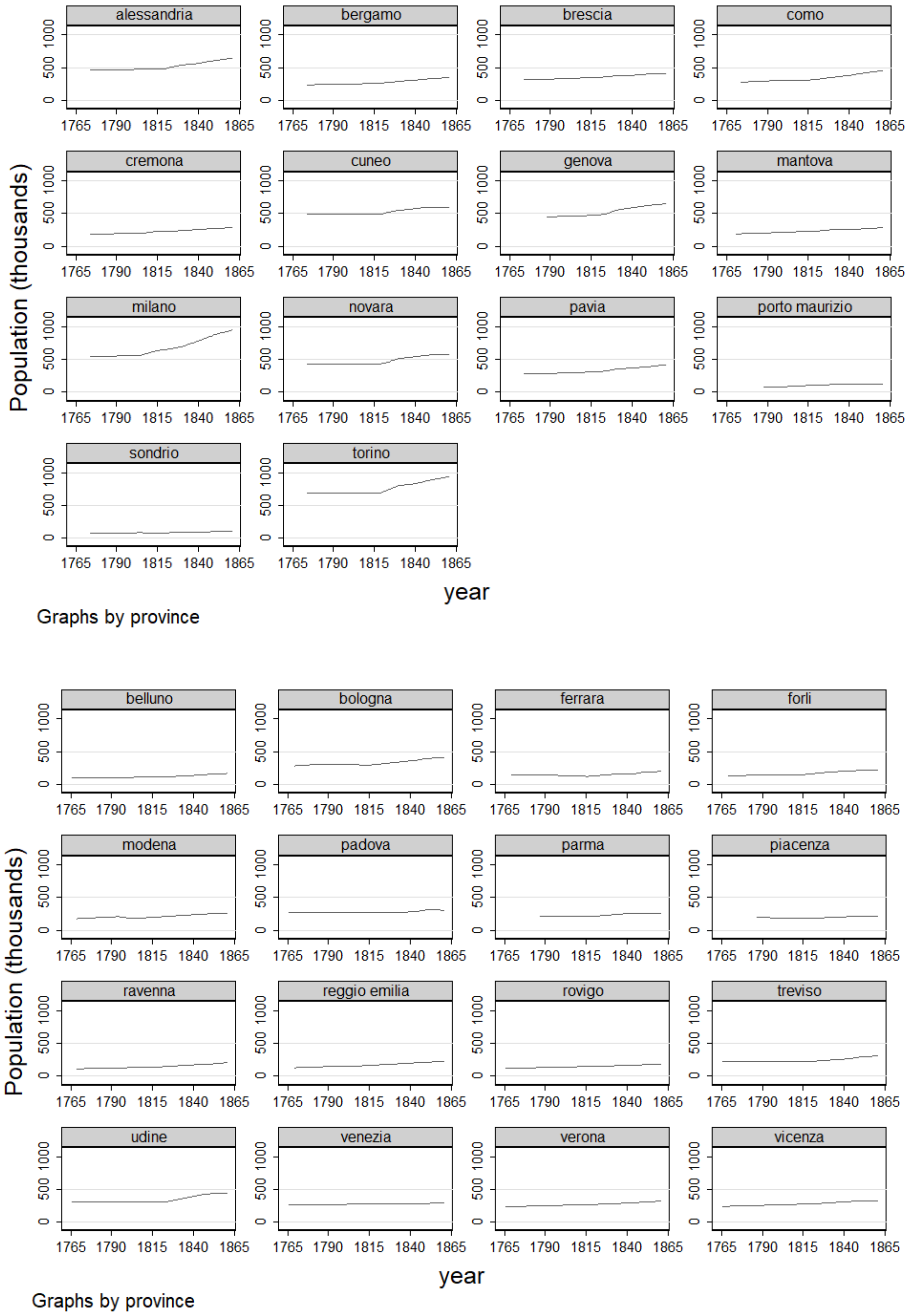
Province	Abbr.	1785	1791	1801	1821	1831	1841	1851	1861
Alessandria	AL	467850	470330	474464	494417	543327	572163	610856	645607
Ancona	AN	192958	198649	208136	227160	236750	248502	263222	254849
Aquila	AQ	209280	216364	226222	247730	271281	302761	306106	309451
Arezzo	AR	140142	150745	157066	163594	184964	202503	215027	219559
Ascoli	AP	158429	156570	153472	155473	168773	185973	202715	196030
Avellino	AV	280862	290118	297080	316917	346878	359853	357737	355621
Bari	BA	288282	299938	316745	362750	429054	466946	510674	554402
Belluno	BL	102920	104845	108054	114471	125856	139284	158514	167229
Benevento	BN	184709	191241	197305	212409	230354	239252	229879	220506
Bergamo	BG	242530	244727	248389	267690	294814	312726	335647	347235
Bologna	BO	303918	302631	300486	310203	336072	363089	398678	407452
Brescia	BS	322981	326987	333663	352307	378449	384232	405397	410351
Cagliari	CA	299845	298281	295674	290459	307164	331418	348319	372097
Caltanissetta	CL	146622	150878	155741	162349	168529	173601	182062	223178
Campobasso	CB	224530	234709	249538	283023	310688	323752	337105	346007
Caserta	CE	535281	538766	517890	489579	536066	581826	617645	653464
Catania	CT	273366	281302	290369	303223	352927	363520	403091	450460
Catanzaro	CZ	243283	248644	255334	275265	317810	364467	381421	384159
Chieti	CH	256496	268660	259431	249748	278469	293558	310437	327316
Como	CO	291277	297782	308624	321884	356015	385634	425724	457434
Cosenza	CS	321477	331603	340813	366911	400862	406225	436914	431691
Cremona	CR	191500	193051	195638	225762	241840	259265	272418	286461
Cuneo	CN	490679	490420	489988	502180	551790	578688	600043	597279
Ferrara	FE	149144	143945	135280	132754	153698	161728	187354	199158
Florence	FI	416676	440046	466645	508132	582828	639131	685041	696214
Foggia	FG	218825	216641	216646	222633	250471	273209	293047	312885
Forlì	FC	140890	142833	146073	163717	189285	200324	218981	224463
Genova	GE		448487	461522	482655	554389	592271	626237	650143
Girgenti	AG	211469	217608	224622	202945	225038	223506	245974	263880
Grosseto	GR	31756	33767	41688	52358	60894	70674	77837	100626
Lecce	LE	295882	302327	305645	323117	372838	403489	425735	447982
Livorno	LI	52235	55063	60561	78516	89771	98040	105311	116811
Lucca	LU	173785	175990	179664	188049	218950	243144	256974	256161
Macerata	MC	155599	161854	172279	194757	208437	219541	232522	229626
Mantova	MN	200609	205393	213367	233201	255307	254621	271268	284012
Massa Carrara	MS	107522	108686	110191	99726	118408	135684	143494	140733

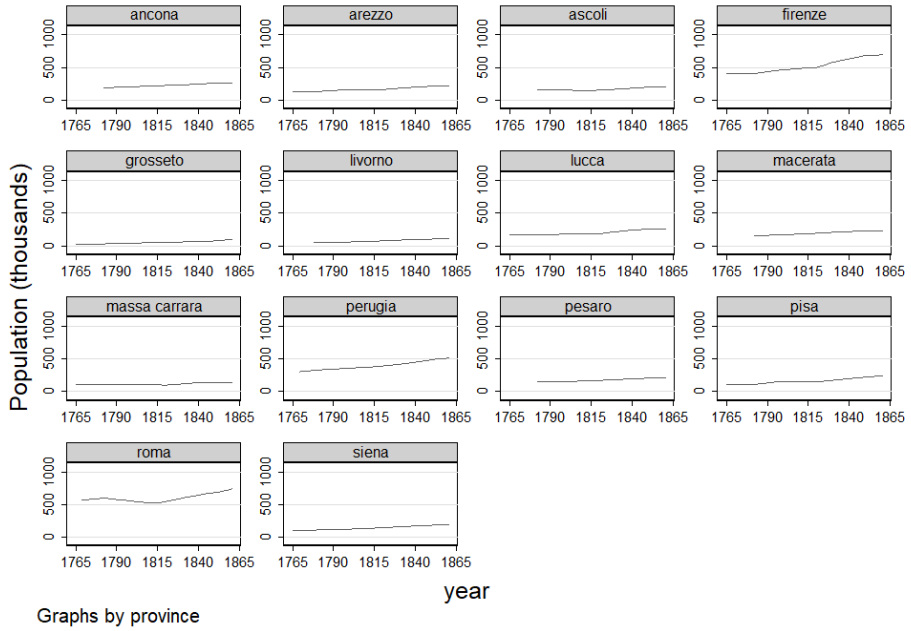
Continued on next page

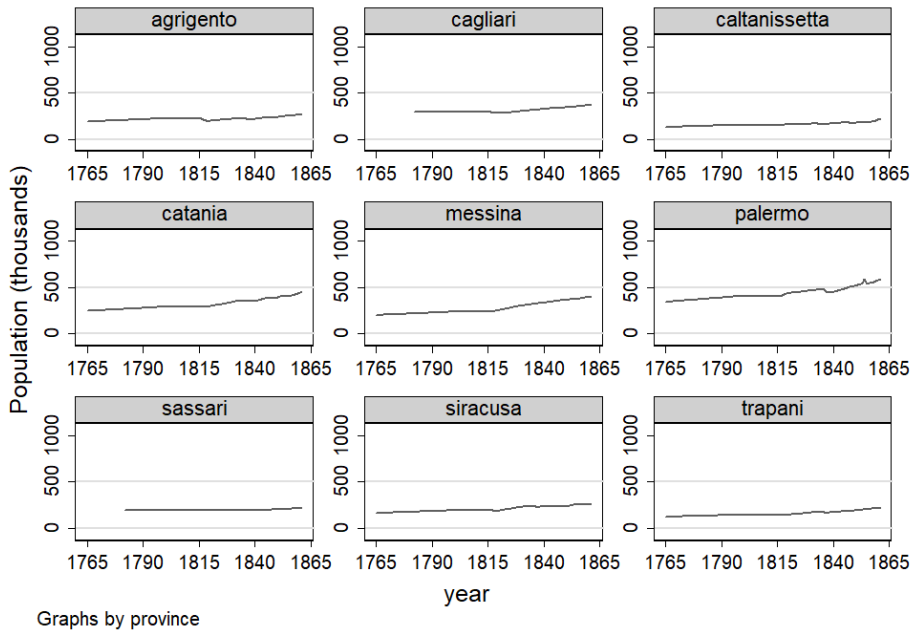
Table 3.8 – continued from previous page

Province	Abbr.	1785	1791	1801	1821	1831	1841	1851	1861
Messina	ME	223661	230154	237572	264647	312463	340554	375055	395139
Milan	MI	550889	553754	558530	653176	703105	791334	888864	948320
Modena	MO	197336	204718	185263	207408	223385	239363	254365	260591
Naples	NA	652880	667912	662341	677389	757585	741204	804593	867983
Novara	NO	430741	430683	430586	444220	516181	546458	569709	579385
Padua	PD	265899	265899	265899	265899	273001	281878	314079	304762
Palermo	PA	382772	393884	406579	443482	471634	461062	528885	585163
Parma	PR		214675	217397	216129	237329	255302	259642	256029
Pavia	PV	284589	287989	293654	313681	352896	370488	389863	419785
Perugia	PG	336107	344719	359073	393774	420116	451644	489559	513019
Pesaro	PU	146038	149542	155381	170880	184359	192826	209400	202568
Piacenza	PC		194126	188965	186147	193911	206299	214726	218569
Pisa	PI	115837	134611	146830	149434	173520	197852	222642	243028
Porto Maurizio	PM		77326	84327	108537	117632	120187	123855	121330
Potenza	PZ	349453	364061	372872	398758	447427	489666	502348	492959
Ravenna	RA	125140	126867	129745	142610	159707	173876	184892	209518
Reggio Calabria	RC	208954	213899	220779	239157	264321	281150	320106	324546
Reggio Emilia	RE	142951	148823	149721	173147	186485	199823	213484	230054
Rome	RM	590424	574591	548203	552264	602550	649544	685726	743025
Rovigo	RO	129832	133347	139206	150924	157568	164408	175588	180647
Salerno	SA	355852	371640	390998	438195	483154	490239	509247	528256
Sassari	SS	196661	197238	198199	200122	199044	197483	208244	215967
Siena	SI	113161	115114	124646	145218	161741	172723	184212	193935
Syracuse	SR	182039	187324	193361	198180	239488	236532	247131	259613
Sondrio	SO	80574	80887	81409	80496	86947	91453	98686	106040
Teramo	TE	145515	150740	153545	165591	193469	204895	217478	230061
Turin	TO	690242	689993	689577	709581	803955	839513	891859	941992
Trapani	TP	137636	141632	146197	150721	173287	175411	198406	214981
Treviso	TV	224894	225985	227802	231436	245555	262750	294894	308483
Udine	UD	305924	306123	306454	307115	347428	397736	433486	440542
Venezia	VE	265649	267770	271304	278372	277385	275267	284173	294450
Verona	VR	246214	250232	256927	270318	279795	289968	308652	317855
Vicenza	VI	252312	256631	263829	278226	292643	308865	326487	327724

Figure 3.5: Provincial trends in population (thousands)




ancona
arezzo
ascoli
firenze
grosseto
livorno
lucca
macerata
massa carrara
perugia
pesaro
pisa
roma
siena
Population (thousands)
0 500 1000
1765 1790 1815 1840 1865
year
Graphs by province


agrigento
cagliari
caltanissetta
catania
messina
palermo
sassari
siracusa
trapani
Population (thousands)
0 500 1000
1765 1790 1815 1840 1865
year
Graphs by province